FORESTRY ABSTRACTS

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CORRIGENDA TO FORESTRY ABSTRACTS

Five-year Index. Part I
p. 51 *Cytisus scoparius* amend entry to read *C.* (*Sarothamnus*)*scoparius* 3 104, 5 89–90
p. 75 add *Sarothamnus* see *Cytisus*

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(species) for *Pinus sondereggii* .. .. read *P. sondereggeri*
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FORESTRY ABSTRACTS

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1.—New readers are reminded of the *Guide to the Use of Forestry Abstracts* which will enable them to get the maximum value from the Abstracts. *See inside back cover.*

2.—Terms appearing in the *Concise Oxford Dictionary* and Chambers's *Technical Dictionary* are ordinarily used in the text without explanation. The *British Commonwealth Forest Terminology* is followed for forestry terms.

3.—From Vol. 18 of the Abstracts up to THREE co-authors' names are cited in titles; if there are more than three, only the first, followed by *et al.*

4.—**Abbreviations.** The more common of those most likely to cause the reader difficulty are given below:—

(*a*) In title citations—

abstr.	= abstract	*n.s.*	= new series	smry.	= summary
app.	= appendix(es)	ref(s).	= reference(s)	*suppl.*	= supplement
dgm(s).	= diagram(s)	*repr.*	= reprint	tbl(s).	= table(s)
gph(s).	= graph(s)	rev.	= revised	transl.	= translation
n.d.	= no date	*ser.*	= series		

From Vol. 18 also, any *italicized* language abbreviation(s) indicate matter in that language additional to any summary, e.g. [Jap.e.*e.*] where English captions to graphs, tables etc. exist.

(*b*) In text—

A.C.	= alternating current	H.ft.	= Hoppus feet	p.a.i.	= periodic annual increment
b.a.	= basal area	h.p.	= horse-power		
bd. ft.	= board foot (feet)	hr.	= hour(s)	p.p.m.	= parts per million
b.h.	= breast height	H.T.	= high tension	q.g.	= quarter girth
b.p.	= boiling point	ht.	= height	R.F.	= radio frequency
c.a.i.	= current annual increment	KVA.	= kilovolt-amperes	rev./min.	= revolutions per minute
		KWH.	= kilowatt-hour(s)		
c.c.	= cubic centimetre	lb.	= pound(s) (weight)	*s.l.*	= *sensu lato*
conc.	= concentrated (solutions)	m.a.i.	= mean annual increment	*s.s.*	= *sensu stricto*
				sp.gr.	= specific gravity
cwt.	= hundredweight(s)	m.p.	= melting point	std.	= standard(s) (timber measure)
D.C.	= direct current				
d.b.h.	= diameter, breast height	m.p.h.	= miles per hour		
g.b.h.	= girth, breast height	o.b.	= over bark	u.b.	= under bark
gal.	= gallon(s)	oz.	= ounce(s)	viz.	= *videlicet*
H.F.	= high frequency	p.a.	= per annum	wt.	= weight

In abstracts relating to the U.S.S.R.—

'CNII lesosplava'	= Central Timber-floating Research Institute
CNIIFM	= Central Plywood and Furniture Research Institute
CNIIMÉ	= Central Research Institute for Mechanization and Electrification in Forest Exploitation
CNIIMOD	= Central Research Institute for the Mechanical Conversion of Wood
CNILHI	= Central Research Institute for Forest Chemistry
UkrNIIMOD	= Ukrainian Research Institute for the Mechanical Conversion of Wood
VIAM	= All-Union Research Institute for Aircraft Materials
VNIALMI	= All-Union Research Institute for Forestry in Agricultural Improvement
VNIILM (formerly VNIILH)	= All-Union Research Institute for Forestry and Forestry Mechanization

Also *F.A.* = Forestry Abstracts.

[P.T.O.

5. **Local measures—**

chain = 66 ft.

cho (Japan): 1·000 cho = 2·451 acres

donum (Cyprus) = 0·333 acre

dunam (Israel) = 0·247 acre

hold (Hungary) = 1·43 acres

koku (Japan): 1·000 koku = 9·827 cu. ft.

maund (India) = $82\frac{2}{7}$ lb.

morgen (S. Africa) = 2·116 acres

oke (Greece) = 2·8 lb.

pikul (Malaya) = 100 katis = $133\frac{1}{3}$ lb.

rai (Thailand) = 0·40 acre

short ton = 2000 lb.

stremma (Greece) = 0·247 acre

tan (Japan): 1·000 tan = 0·245 acre

U.S. gallon = 0·84 English gal.

FORESTRY ABSTRACTS

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SAP-STAIN OF TIMBER*

By

W. P. K. FINDLAY

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1. INTRODUCTION

Abnormal discolorations in wood may result from a variety of causes. It is proposed in this article to deal only with the stains caused by the growth through the wood of fungi that discolour the wood without decomposing it. Such discoloration is commonly known as sap-stain, since in trees that form heartwood it is usually confined to the sapwood. As the colour that these fungi impart to the wood is frequently a bluish-grey, the stain is often referred to as blue stain. Incipient decay ('dote') may cause brown streaks and spots or localized bleaching of the wood, but it never gives rise to a bluish-grey colour. Again, contact with iron compounds may bring about inky-black or grey stains in woods that contain tannin, but the distribution of such stains differs from that of sap-stain due to fungi. Iron staining is usually superficial unless it has developed round a fastening, and it does not tend to follow the rays of the wood. A fairly simple chemical test can generally determine whether staining has been due to contact with iron.

Greyish-brown stains can also develop in some timbers, such as Sycamore and Persimmon, by oxidation of cell contents. This type of stain can be prevented either by rapid drying of the surface or, in Persimmon, by a short steaming treatment to inactivate the oxidizing enzymes; it sometimes develops below piling sticks, when it is termed 'sticker stain'. So-called mineral stain or streak is another form of discoloration, often of a greenish tinge, that occurs in standing trees, particularly Maples. Its cause is obscure; no obvious signs of fungal infection can be found and the discoloured zones are as hard as or even harder than the normal wood.

A useful table for the diagnosis of various kinds of staining is given in a bulletin by Scheffer and Lindgren (1940). In this, some consideration is given to non-fungal stains due to oxidation of cell contents and other chemical changes that occur in wood during seasoning. A general survey of blue stain and its effect on wood has been published (in Dutch) by Hof (1952), who included a good bibliography of the literature up to that date. A succinct review of information on blue-stain fungi has also been given by Bavendamm (1954).

Staining due to fungi may be superficial or penetrating. Superficial staining is generally due to a growth of moulds over the surface of the wood, the colour coming mainly from the coloured spores of the fungi. Deep-seated penetrating stains are caused by fungi that have dark-coloured hyphae or that produce pigments diffusing into and staining the cell-walls of the wood. The colouring matter in the dark-coloured hyphae of the blue-stain fungi has been shown by Kitamura and Kondo (1958) to be a melanin.

It may be necessary to resort to microscopic examination in order to determine whether staining in any particular sample is in fact due to fungal infection. Penetrating blue stain can be recognized immediately by the presence of thick-walled, dark-brown hyphae in the elements of the wood; these hyphae first permeate the rays but also penetrate into tracheids and vessels of some species.

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2. FUNGI RESPONSIBLE FOR STAINING

The observation that blue stain in softwoods is caused by a fungus possessing dark-brown hyphae is generally attributed to Hartig (1878), who considered it to be the fungus then known as *Ceratostoma piliferum*. Earlier, Willkomm (1866) had illustrated these hyphae in decayed Spruce wood but had considered them as belonging to the fungus responsible for causing the heart rot.

In 1878 Saccardo established the genus *Ceratostomella* for the species of *Ceratostoma* with colourless spores, and *C. pilifera* was later transferred to this new genus. For a long time *Ceratostomella pilifera* was looked upon as the specific fungus resonsible for the bluing of coniferous timber. The first detailed study of this fungus and of the damage it causes was made by Von Schrenk (1903). Soon afterwards Hedgcock (1906) in the U.S.A. described a number of new species of *Ceratostomella* capable of causing stain in Pine and Sweet Gum (*Liquidambar styraciflua*). He was also able to demonstrate that a number of Fungi imperfecti can be responsible for various other sap-stains and that reddish stains may be caused by *Penicillium* spp. In his now classical researches Münch (1908) showed that more than one species was involved in the *C. pilifera* group. Nearly all species of *Ceratostomella* produce more than one type of spore, and over the years there has been much discussion as to whether the species that produce different types of secondary spores should be placed in different genera. Münch (1908), for instance, proposed that the species which produce conidia endogenously (from within the tip of a hypha) should be placed in a separate genus, *Endoconidiophora*. The principal species in this group, *E. coerulescens*, is characterized by the formation in culture of a strong fruity odour which Birkinshaw and Morgan (1950) have shown to be due to isobutyl acetate. Goidanich (1936) proposed that the species having a *Leptographium* imperfect stage should be put in a genus called *Grosmannia*. In a later paper (1937) he described the principal species of fungi causing staining of Pine in Italy.

It is now clear that the genus *Ceratostomella*, as originally described, contained two dissimilar groups of species which must be separated; the group that contains the sap-staining organisms was transferred by Melin and Nannfeldt (1934) to the genus *Ophiostoma* of H. & P. Sydow. Bakshi (1951) revived an older name, *Ceratocystis* (originally established by Ellis and Halstead) for this group, and Hunt (1956), who has made a careful study of the whole group, has accepted this name for the sap-staining fungi previously included in *Ceratostomella*. He has given in his paper a key to all the species that he recognizes. Following Hunt's careful study there now seems to be a good chance of a stable nomenclature for this group of fungi, and his nomenclature will therefore be followed here.

In addition to *Ceratocystis* spp. there are a number of Fungi imperfecti that cause staining in coniferous wood, the most important of which are probably *Pullularia* (= *Dematium*) *pullulans*, *Hormiscium gelatinosum*, *Cladosporium herbarum* (= *Hormodendrum cladosporioides*), *Cadophora fastigiata*, *Diplodia* spp., and *Graphium* spp. Excellent and full descriptions of the more important species that cause bluing in Pine and Spruce have been given by Lagerberg, Lundberg and Melin (1927). Other important contributions to the literature on staining fungi have come from Scandinavian studies of the discoloration of wood pulp, which is caused in part by the fungi that stain solid wood. Robak (1932) demonstrated that some of the fungi causing sap-stain in wood also stain wood pulp, but that *Ceratocystis* spp. are not important in this respect. Later Rennerfelt (1937) found *Cadophora fastigiata* and *Pullularia pullulans* to be the commonest causes of stain both in newly manufactured and in stored pulp.

The species of fungi found to discolour wood in Russia were briefly described by Vanin (1932) and to these in 1934 three new species of *Ceratostomella* (*Ceratocystis*) were added by Miller and Cernzow. A description of all the species known to cause staining in Russia, with keys for their identification, was published in 1953 by Mejer.

The principal sap-stain fungi in America were described in detail by Rumbold (1929) and Davidson (1935), and their relative importance and seasonal prevalence was subsequently assessed by Verrall (1939), who later (1941) made a study of the fungi associated with staining in chemically treated green timbers. In his opinion *Ceratocystis* (*Endoconidiophora*) *coerulescens* is the most important staining fungus on hardwoods in the southern U.S.A. and *Ceratocystis pilifera* the chief cause of staining in both treated and untreated softwoods.

Staining of hardwoods has received somewhat less attention than blue stain in Pine. Goidanich *et al.* (1938) made a detailed study of the fungi that infect and stain pulp made from Poplar in Italy. The stains occurring in Poplar wood after felling have recently been studied by Gambogi (1957), who isolated *Sphaeropsis ellisii* and *Pestalotia lignorum* from yellow-stained wood. Much of the experimental work on control of sap-stain in the southern U.S.A. was carried out on Sweet Gum.

Recent investigations at Princes Risborough have shown that staining in light-coloured tropical

hardwoods is caused principally by *Diplodia* spp., in particular by *Lasiodiplodia* (*Botryodiplodia*), *theobromae*, and rather less frequently by a closely related species, *Diplodia natalensis*.

Penetrating fungal stains of other colours than blue-grey occur in a number of woods. Purplish-pink stains are often caused by species of *Fusarium*, orange-red stains by *Penicillium* sp., e.g. *P. aureum*, *P. funiculosum*. A pink stain in both sap- and heartwood of North American softwoods has been shown by Chidester (1936) to be caused by *Geotrichum* sp. Davidson and Lombard (1954) have shown that pinkish-brown stains in Sitka Spruce and other softwoods can be caused by *Ascocybe grovesii*.

The yellow stain that develops in Oak (causing so-called 'golden oak'), Sweet Chestnut, Walnut and other hardwoods during seasoning, is caused by *Paecilomyces varioti*. The appearance of this fungus in Oak was described by Williamson (1923), who called it *Eidamia catenulata*. It can grow at temperatures up to 44° C. and is sometimes troublesome during the earlier stages of kiln-drying Oak and other hardwoods that must be dried slowly.

The well known 'green oak' sometimes used for inlay is due to the growth through the wood of *Chlorosplenium aeruginosum*, a fungus that can cause similar staining in a number of hardwoods. This species is probably the only staining fungus that has been subject of a patent! Professor F. T. Brooks in 1911 took out a patent to cover its use for the purpose of staining wood green. This fungus has been described in some detail by Martinez (1943).

Patchy brown stains are often an indication of incipient decay, but a more uniform brown stain of the sapwood may be due to infection by a sap-staining fungus. A dark chocolate-brown stain in Red Pine sapwood was found by Fritz (1952) to be caused by a *Cytospora* sp. which had no effect on the strength of the wood. A coffee-brown discoloration of converted Scots Pine was found by Glaser *et al.* (1956) to be caused by *Discula brunneo-tingens*. Later these workers (Glaser *et al.*, 1958) published the results of mechanical tests on wood stained brown by this fungus, showing that its strength did not differ significantly from that of sound wood, whereas the impact strength of wood stained by *Stereum sanguinolentum*, a wood-rotting fungus, was 40% lower. A reddish-brown stain in Spruce, seen as wedge-shaped areas on the end grain, is usually caused by *S. sanguinolentum* at an early stage of attack, with only a slight effect on the bending strength of the wood. Wells (1954) has described a brown surface stain of Canadian softwoods caused by *Ascocybe grovesii*, a fungus that produces hat-shaped ascospores and which is said to be resistant to sodium pentachlorophenol (hereafter referred to as NaPCP).

3. MODE OF INFECTION

Wind and rain. Although the spores of many sap-staining fungi are wet and sticky when produced, air currents must play a major part in bringing infection to freshly sawn wood, and it has been shown by Björkman (1946) (*b*), Mathiesen-Käärik (1955) and others that the air in timberyards and pulpmills may contain large numbers of the spores of these fungi, and probably also fragments of mycelium from the dust formed during the sawing of stained logs. Doubtless some spores are also distributed in drops of rainwater splashing from board to board.

Insects. Barkbeetles play an important role in disseminating the spores. In standing trees sap-stain appears only when they have been so damaged or weakened that the sapwood partially dries out, and the appearance of stain is frequently associated with barkbeetle attack. Thereafter staining fungi can permeate the sapwood very quickly; Bramble and Holst (1940) found the sapwood of Shortleaf Pines infected with *Ceratocystis pini* only 24 hours after it had been invaded by barkbeetles. Brown stains in White Fir (*Abies concolor*) which Wright (1935, 1938) traced to *Trichosporium symbioticum* and *Spicaria anomala*, were considered to be associated with *Scolytus* spp.

In logs, too, barkbeetles appear to be active disseminators of sap-stain, many species being associated with specific fungi. Those introduced by *Dendroctonus* were fully described by Rumbold (1936), and the incidence of *Ceratocystis ips* has been correlated with infestations of *Ips* beetles. Again, boards have been observed in which the tracks of beetles were clearly marked by little patches of infection by *Ascocybe grovesii*. Dark stains frequently develop around the tunnels of pinhole borers which introduce the so-called ambrosia fungi when they bore into logs. Our knowledge about these has been comprehensively reviewed by Fisher *et al.* (1953/1954).

The association between barkbeetles and staining fungi in Europe was first exhaustively studied by Grosmann (1930) in Germany and later by Siemaszko (1939) in Poland, the latter finding that *Ips typographus* was constantly associated with *Ceratocystis penicillata* and certain yeasts. Rennerfelt (1951) confirmed this association and recorded that the fungi most usually introduced by *Blastophagus minor* were *Ceratocystis canum* and *Trichosporium tingens*. The latter and its variety *macrosporium* were stated by Francke-Grosmann (1952) to be the species of staining fungi most closely associated with the barkbeetles *Myelophilus minor* and *Ips acuminatus*, and to be able to cause rapid and deeply

penetrating blue-stain in Pine trees affected by the beetles. A grey stain in Engelmann Spruce invaded by *Dendroctonus engelmanni* was traced by Davidson (1954) to a *Leptographium* sp.

Mathiesen (1950) suggested that one may regard the staining fungi associated with barkbeetles as falling into 3 classes: first, those that are distributed mainly by wind and only incidentally by insects; secondly, those associated sporadically with more than one species of beetle; and thirdly, those that are invariably associated with specific beetles, *Ips acuminatus*, for example, being constantly accompanied by *Ceratocystis clavatum*.

4. FACTORS INFLUENCING FUNGAL STAINING

Type of wood. Sap-stain by its very name implies that the fungal staining affects mainly the sapwood. With few exceptions this is true; occasionally a small amount of ordinary blue-stain may be observed in the heartwood of Douglas Fir, Sitka Spruce and Pines, especially where this has been in contact with green sapwood in a seasoning pile. The restriction of these staining fungi to sapwood may be explained partly by the fact of its containing reserve food materials such as starch and sugar, and partly by the presence in the heartwood, at least in some species, of substances toxic to the fungi. Rennerfelt (1945), for example, was able to show that sapwood impregnated with quite low concentrations of pinosylvin and other phenols extracted from heartwood, was fairly resistant to sap-staining fungi.

The sapwood of Pines is very much more susceptible to stain than that of Spruces, but no adequate explanation for this has yet been offered.

In temperate countries, staining of hardwoods is of minor importance compared with staining in softwoods. Poplar is probably the most susceptible of European hardwoods, both as regards its wood and its pulp, and the factors influencing this have been studied by Rogister (1955). In the U.S.A., Sweet Gum is one of the hardwoods in which staining is most troublesome.

In many light-coloured tropical hardwoods, staining is a serious problem and may even prevent their successful exploitation. Among timbers that are particularly prone, the following may be quoted: Balsa, Celtis, Jelutong, Maracaibo Boxwood, Obeche, Pterygota and Ramin.

Superficial mould growth, as distinct from deep-seated sap-stain, may develop on almost any kind of wood under persistently damp conditions, but it is always much more vigorous on sapwood than heartwood.

Time of felling. It has often been said that softwoods felled in the spring and summer are more susceptible to stain than those felled in the winter, but controlled experiments do not support this. It is merely that staining fungi do not attack wood during cold weather and by the time warmer weather arrives, wood that has been felled and converted in the winter may have partly seasoned and so become less subject to attack. In this connexion Rogister (1955) carried out a long series of experiments on samples taken from Poplar trees felled at different seasons of the year. Woods from logs felled in March/April and in July showed the maximum susceptibility to *Lasiodiplodia theobromae*. Wood freshly cut in December, May and June was more or less immune. An interesting observation was that timber felled in the autumn became much more susceptible to stain in the following February and March. Presumably, changes in the amount and nature of the reserve materials in the living parenchyma cells of the wood were mainly responsible for these variations in susceptibility. The fact that steaming under pressure increases the susceptibility of this wood to stains lends support to this suggestion. Again, softwood that has been immersed or floated in water for considerable periods, has been found to be rather less susceptible to certain staining fungi, presumably owing to loss by leaching of nutrients from the wood.

Obeche logs in which fermentation of the sap has occurred may become almost immune to *Lasiodiplodia* attack, probably because the organisms responsible for the fermentation have formed some antibiotic substances.

Moisture content of the wood. The moisture content of the sapwood in a vigorously growing living tree is too high to permit the growth of staining fungi, which are strongly aerobic organisms. Should this m.c., however, be reduced by injuries or insect attack, the sapwood of standing trees may become infected. One can speak of a limiting maximum m.c. for the development of staining fungi only in relation to the density of the wood; the lower the density of the wood, the more air and water it can contain. Münch (1908) stated that winter-felled Pine which had lost about 10–20% of its weight, as water, then contained sufficient air for blue-stain fungi to grow through the whole of the sapwood. Lagerberg *et al.* (1927) confirmed Münch's view that the supply of oxygen is the factor limiting the growth of these fungi in wood with a high m.c. The minimum m.c. for the growth of most staining fungi is about 27–28% (i.e. about the fibre-saturation point of the wood) but Colley and Rumbold (1930) found the lower limit for staining of Loblolly Pine by *Ceratocystis pilifera* to be about 24%, a figure

later confirmed by both Lindgren (1942) and Björkman (1946) (*b*). Later Bellmann and Francke-Grosmann (1952) reported that blue-stain fungi died out in wood containing less than 22% of moisture. Staining fungi can grow on wood that has been air-dried and re-wetted but, in general, they seem to grow more vigorously on wood that is drying for the first time from the green condition than on rewetted wood.

Scheffer and Chidester (1948) considered that staining fungi do not in general survive so long in air-dry wood as some of the rotting species, and that they are for the most part killed during seasoning before the wood is used. In their tests on specimens infected in the laboratory, they found that the staining fungi did not survive much more than 2½ months in wood at 12% m.c. However, in these experiments the wood was kept at 80° F., and possibly some of these fungi might survive somewhat longer at rather lower temperatures. In the author's laboratory *Lasiodiplodia theobromae* has survived up to three years in Ramin blocks kept at 9·5% m.c.

Temperature. Like other fungi, the species that cause staining grow very much more rapidly under warm conditions than cool; it is therefore much more difficult to extract timber in a clean condition in the tropics than it is in temperate countries where much of the felling and conversion can be carried out during cold weather when the fungi are not active. Detailed studies of the temperature relations of staining fungi have been made by Lindgren (1942). The optimum temperature for the growth of most species of *Ceratocystis* (isolated in Canada) is about 25° C., but *C. ips* and strains of other similar *Ceratocystis* spp. from the Gulf States of the U.S.A. grow most rapidly at about 28–29°. *Lasiodiplodia theobromae*, as might be expected from its frequency in the tropics, grows most quickly at about 27°. The fungus that causes golden stain in Oak grows rapidly at 40° and makes some growth at 44–45°. The maximum temperature at which the blue-stain fungi can grow is about 35°. Growth is slow at temperatures below 5° and *Lasiodiplodia* makes little growth below 10°.

Staining fungi are fairly resistant to high temperatures. Fritz (1929) found a blue-stain fungus alive after 12 hours at 49° C. and 1 hour at 60°, but Scheffer and Lindgren (1940) suggest that exposure for a few days at temperatures not far above the optimum may prove lethal. Lindgren (1942) found that all the species he tested, with the exception of *C. ips*, were dead after two days at 40°. Recent experiments in the author's laboratory suggest that *Lasiodiplodia* spp. are more resistant to heat than other staining fungi and can survive many hours' exposure to temperatures up to 65°. Sap-stain fungi can survive long periods of exposure to extremely low temperatures, cultures having been kept at −183° without suffering any harm.

5. EFFECT OF SAP-STAIN ON PROPERTIES OF WOOD

Effect on mechanical strength. Many investigations have been carried out in order to discover whether sap-stain affects the mechanical properties of wood. A summary of the earlier work on this subject will be found in a bulletin by Scheffer and Lindgren (1940). So far as blue stain in softwoods is concerned, it has been established that bending and compressive strengths are never seriously affected, but that the toughness (shock resistance) of heavily stained softwood may be significantly lower than that of normal wood (Findlay and Pettifor 1939). Doubtless the individual staining fungi vary between themselves in any effects that they may have and the timbers likewise vary in their susceptibility to attack. Da Costa (1955), for instance, found no significant decrease in the bending or impact strength of *Pinus radiata* samples that had been exposed to *Diplodia pini* for 12 weeks. Thunell (1952), on the other hand, did find that the stain caused by *Ceratocystis* (*Ophiostoma*) *pini* could effect small but statistically significant decreases in the bending and compressive strengths of Pine sapwood and a loss of up to 30% in its impact bending strength. He concluded that these effects had no practical significance in timber to be used for building work.

There is some evidence that steaming of wood increases its susceptibility to sap-staining fungi and accentuates any deleterious effects they may have on the strength of the wood (Chapman, 1933).

Soft tropical hardwoods of low density appear to suffer rather greater losses in strength as a result of staining by *Lasiodiplodia theobromae*. Findlay and Pettifor (1939) found that not only was the toughness reduced by 30–40% of its original value but that the bending strength might decrease by as much as 20%.

Less attention has been paid to the effect of other types of fungal staining on strength. Fritz (1952) showed that brown stain in Pine sapwood does not of itself reduce the strength of the wood. Oak stained yellow by *Paecilomyces varioti* was shown by Lindgren and Scheffer (1939) to be only very slightly less tough than normal wood, but 'brown oak', which in fact denotes an early stage of attack by *Fistulina hepatica*, is appreciably softer than normal Oak.

Microscopic effects on wood tissue. When wood infected with staining fungi is examined under the microscope, rather stout dark-brown hyphae with frequent cross-walls can be seen in the cell cavities.

With some species the hyphae are concentrated in the ray cells and only occasionally grow in the vessels or tracheids. On the other hand, the hyphae of *Diplodia* spp. penetrate freely into all the elements of certain hardwoods. A characteristic feature of the hyphae of many species is that they penetrate in a straight line across a whole series of tracheids. Penetration of the cell-walls seems to be effected by mechanical pressure and the actual bore-holes remain very much smaller than the diameter of the hyphae themselves. Electron-microscope studies of blue-stained wood by Liese and Hartmann-Fahnenbrock (1953) have revealed that in Pine wood infected with *Scopularia phycomyces* the hyphae break down the torus of the bordered pits mechanically. No definite visible alterations of the cell-walls through enzymatic action were detected.

Effect on moisture relations and permeability. There is little difference in the rate of drying between stained and clean *sawn* timber, nor, according to Scheffer (1941) in their final equilibrium moisture content, but Bellmann and Francke-Grosmann (1952) found that stained wood *in the round* dries more slowly than normal wood, and explain this on the grounds that the rays are choked with hyphae.

It is now generally agreed that stained wood *after it has been seasoned* is much more permeable than clean wood to the penetration of liquids. Lindgren and Scheffer (1939) found that the uptake of creosote during a hot-and-cold open-tank treatment was more than twice as great in wood stained by *C. pilifera* as it was in matched unstained wood. Bellmann and Francke-Grosmann (1952) obtained similar results with stained wood impregnated with creosote in a cylinder, but pointed out that since stained wood absorbs liquids more easily than clean, it is important to protect stained timber, once it has been seasoned, against rain. They noted that whereas in normal wood the preservative penetrates mainly into the late-wood zones, there was considerable penetration of oil into the early wood of the stained samples.

The permeability of some kinds of timber to wood preservatives may be very greatly increased by the growth through the wood of certain moulds that do not stain it, such as *Trichoderma viride*. Lindgren (1952) found that the absorption of oil into end-coated 2-ft. lengths of Longleaf Pine during a 5 minutes' soak was increased from about 1 lb. in clean controls to 8 or 9 lb. per cu. ft. in heavily moulded samples. Both clean and mouldy samples had, of course, been fully air-dried before treatment. The growth of these moulds on the timber can be greatly stimulated by spraying with a 3–4% solution of $NH_4F{\cdot}HF$ or NaF which will prevent the development of any rotting fungi while the mould growth is developing on the closely stacked timber.

The permeability of Spruce and Aspen to an oil solvent used for some preservatives in U.S.A. was found by Schulz (1956) to be similarly increased by allowing the wood to become heavily overgrown with moulds that had been encouraged by storage for a few weeks under damp conditions, after treatment of the wood with fluoride solutions.

In view of the very large increases in absorption obtained in mouldy wood, it would seem profitable to explore further the possibility of using on a practical scale this method of increasing permeability in woods such as Spruce that are resistant to penetration by preservatives.

Effect on resistance to decay. It was at one time thought that blue-stained wood was more susceptible to decay than clean wood. Although Findlay (1939) found slightly more rapid decay in stained wood than in clean, he concluded that any slight differences in decay resistance that may exist are without practical significance. Mejer (1946) reported that the growth of 3 fungi that cause dry rot in buildings was stimulated by prior infection with *Leptographium lundbergii*, while *Pullularia pullulans* stimulated the growth of *Poria vaporaria* and *Coniophora cerebella*. Tsukiji (1952) found *Pinus densiflora* sapwood stained by *Ceratocystis ips* to be as resistant as clean timber to the four test fungi that he used. Radvan (1951) obtained somewhat contradictory results with Pine sapwood stained with *Ceratocystis* sp., finding some indication that wood containing living sap-staining fungus was more resistant and wood containing dead staining fungus less resistant to decay than clean wood. Since sapwood in any case has only a low resistance to decay, it is evident that any slight differences that may result from infection by staining fungi cannot be important in practice.

Effect on paper-making properties. It might be expected that the presence of sap-stain in pulpwood would seriously affect the quality of the paper made from it, but this does not appear to be the case, unless a high proportion of the wood is intensely stained. Lindgren and Scheffer (1939) suggest that at least 10% of the volume of the wood must be stained to have any noticeable effect, and even up to 25% of stained wood still yields a fairly light-coloured pulp. Since staining fungi, unlike wood-rotting fungi, do not decompose cellulose, they do not affect the yield of pulp nor the strength of the paper made from it, and the only ill effect they have is to increase somewhat the amount of bleaching powder required to yield a white pulp.

Effect on paint. Once stained timber is seasoned it can be painted as satisfactorily as unstained, and provided that the wood remains dry, the stain has no effect on the overlying paint film. If,

however, paint is applied to imperfectly seasoned wood containing staining fungi in an active condition, or if stained wood containing still living infection is re-wetted, then the staining fungi may grow into the paint film and discolour it, or they may actually break up the film with their hyphae and spore-bearing structures (Schulze & Theden, 1951). *Pullularia pullulans*, which is quite a common cause of sap-stain in Pine, is one of the commonest moulds growing in and disfiguring paint films, and if paint is applied to wood stained by this fungus, and moisture finds its way into the wood, the film may get discoloured and damaged. Since stained wood absorbs moisture so much more readily than clean wood, penetration of moisture can easily occur in exposed joinery made of stained wood if the joints are not perfectly tight. If, therefore, stained timber is used for window frames and other exposed joinery, the wood should be brushed over with a wood preservative containing a sealer against moisture or the priming coat should contain an effective fungicide.

6. EFFECT OF SAP-STAIN ON CONTENTS OF PACKING CASES, ETC.

A bright clean appearance is considered essential for many types of cases and containers, especially those intended for foodstuffs, drinks or soap, and for this reason alone sap-stain may seriously reduce the value of wood for packing-case manufacture. Apart from any question of appearance, staining fungi and moulds may actually damage or intensify damage to goods stored in contact with the wood. Thus moulds usually produce appreciable amounts of organic acids which may accelerate corrosion of metal articles; they may even spread to and infect fruit or eggs in the cases if the moisture content of the latter should rise above the fibre-saturation point (Young, 1948). Under normal export conditions, however, stained timber can be used with little risk of damage to the contents of the cases, *provided that the wood is fully air-dry when the cases are used.*

Part II (and bibliography) will appear in the next number.

ABSTRACT SECTION

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

Translations

See Nos. 972, 1134–5, 1187–8, 1199, 1234.

0 (021). Handbooks. Textbooks

1. RUBNER, K. Neudammer forstliches Lehrbuch. Lieferung 4, 5, 6. **[Neudamm textbook of forestry. Parts 4–6.]** Neudamm Verlag, Radebeul and Berlin. 11th ed. 1955; 1957. pp. 577–830; pp. 1–208; pp. 209–495. [G.]

[Cf. *F.A.* 14 No. 2337.] Part 4 comprises sections on Forestry Work (*H. H. Hilf*); and Forest Utilization: wood properties (*K. Rubner*); sorting and grading of timber (*H. H. Hilf*); use of minor forest products (*H. H. Hilf*); sawmilling (*J. H. Flatscher*); preservation (*H. Wienhaus*); pulp, fibreboards and chip-boards, hydrolysis, distillation etc. (*H. Wienhaus*). Part 5 comprises: Surveying (*J. Windirsch*); photogrammetry (*W. von Laer*); forest roads and transport (*J. Windirsch*); water relations and hydrology, control of avalanches etc. (*E. Kirwald*). Part 6 comprises: Measurement of trees and timber (*E. Assmann*); increment and yield (*K. Vanselow*); forest management (*A. M. Röhrl*, revised by *W. Mantel*); Valuation (*J. Köstler*, revised by *W. Mantel*); and administration, planning, education and training (*K. Abetz*).

0 (038). Dictionaries

See No. 14.

0 (048.1). Bibliographical Lists

See also Nos. 16, 20, 29, 79, 94, 100, 116, 415, 518, 634–5, 1198.

2. HAUBERG, P. A. [Compiler]. Den danske Skovsbrugs-litteratur 1926–1945. **[Danish forest literature 1926–45: Parts I and II.]** Den Forstlige Forsøgskommission, Springforbi. 2 vols., 1957. pp. 507. [Dan.E.]

Covers items published in Denmark or abroad by Danes who work or have chiefly worked in Denmark, and those on Denmark published elsewhere. Part I is arranged alphabetically under authors, with separate sections for anonymous and collective works, and Part II by subjects. There is an index to subjects (in Danish only).

3. SEPPÄLÄ, A. [Compiler]. **Bibliographia Universalis Silviculturae: Fennia 1939–40.** Helsingin Yliopiston Metsäkirjasto, Helsinki. 1958. pp. 83. [Fi.G.] Price *Finmark* 500.

A bibliography of Finnish forestry literature. Titles, with a German translation unless the original gives German, French or English titles, are arranged by the Flury decimal classification.

0 (084.3/.4). Maps. Atlases

4. Carte des sols et de la végétation du Congo Belge et du Ruanda-Urundi. 6. Yangambi. Planchette 3: Lilanda. A et B. **[Map of the soils and vegetation of the Belgian Congo and Ruanda-Urundi. 6. Yangambi. Sheet 3: Lilanda. A and B.]** Institut National pour l'Étude Agronomique du Congo Belge (I.N.É.A.C.), Brussels. 1957. pp. 32 + 2 maps. 14 refs. [F.]

Consists of an explanatory booklet (*P. Gilson, P. Jongen, A. van Wambeke* and *L. Liben*); the soil map, scale 1: 50,000 (*P. Gilson, P. Jongen, A. van Wambeke*); and the vegetation map, scale 1: 50,000 (*L. Liben*).

0 - - 011. Terminology. Nomenclature

See Nos. 14, 166–7, 307, 929, 939.

0 - - 015. Mathematical and Statistical Methods

5. GROSENBAUGH, L. R. **The elusive formula of best fit : a comprehensive new machine program.** *Occ. Pap. Sth. For. Exp. Sta.* No. 158, 1958. pp. 9.

Describes a service for foresters, by which any set of data may be analysed on an electronic machine, to give all the least-squares formulae that predict *Y*, using every possible linear combination of 9 or fewer variables. The Southern Forest Experiment Station '704 Regression Program' has been devised for use with an IBM 704 Electronic Data Processing Machine, to handle up to 500 observations of *Y*.

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

See also No. 202.

111. The Atmosphere. Meteorology. Climate and Microclimate

111.2. Radiation and Temperature

See also Nos. 9, 11.

6. BROWN, G. S. **Light in the forest.** *Emp. For. Rev.* 37 (2), 1958 (222–32). 4 refs.

In view of the difficulties of measuring light directly in the forests, suggests a method, sufficiently accurate for most silvicultural purposes, involving the taking of vertical photographs in the forest and measuring from them the degree to which the sky is obscured. The method is described and illustrated by practical application in lowland dipterocarp forest in Malaya. [Cf. *F.A.* 18 No. 3184.]

7. INOUE, K., and OTA, I. **[Wavelength of the sunshine in the forest.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 8, 1957 (128–57). 10 refs. [Jap.jap.e.*e.*]

The ease of regenerating conifers under hardwoods

led to a study of the characteristics of the sunlight reaching seedlings through canopies of coniferous and broadleaved species and its possible effect on their establishment. For this study, (*a*) laboratory spectrometer measurements and (*b*) field tests were made. From (*a*) it was found that the leaf is able to reflect little light; red leaves had a coefficient of transmission (c.t.) less than the green at wave lengths < 700 mμ and larger than the green above this. The c.t. of the red leaf was very low at 700–800 mμ. From (*b*) it was found that the proportion of the longer wavelengths increases more rapidly in the broadleaved than in the conifer forest. In Oak/*Cercidiphyllum*/Birch the proportion of longer wavelength is comparatively large. This proportion changes with forest type, age, crown density etc., and thinning appears to increase the proportion of longer wavelength.

111.5. Wind

8. EDWARDS, M. V., STEWART, G. G., and LINES, R. **Estimation of exposure by flags.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (47–8).

[Cf. *F.A.* 17 No. 3914.] The current experiment is an attempt to correlate the growth of trees in the older experimental areas (where trees have been growing for 25–30 years) with the new pilot plantations, where trees may grow well while they are still in the shelter of the plough ridges, yet never reach normal dimensions when they grow up into the blast. The method is to expose small unhemmed flags of standard-specification cotton cloth for a period of 2–3 months. All the flags are put out at the same time and, after exposure, they are all called in together and the area remaining untattered is measured. After several periods of exposure it was soon clear that the worst of the new pilot plantations in Caithness, Orkney and Shetlands were in a different class of exposure from the older experimental areas such as Teindland, Morayshire, and the Lon Mor. The northern flags were often 3–4 times as tattered as those at the latter sites. Work is proceeding in an attempt to correlate the rate of tatter of a standard flag with the periodic readings of an anemometer recording the run of wind in miles.

111.7. Humidity, Evaporation. Clouds etc. Precipitation

See also No. 12.

9. KORTÜM, F. Der Einfluss meteorologischer Parameter auf die Verdunstung der Erdoberfläche. **[The influence of meteorological parameters on evaporation from the earth's surface.]** *Arch. Forstw.* 7 (3), 1958 (220–31). 30 refs. [G.g.russ.e.]

Discusses the development and interpretation of the solar radiation equation $S + B + L + V = 0$, where S is net radiation, B the energy exchange between the superficial and deeper layers of the earth, L that between the earth's surface and the atmosphere, and V that of water vapour in evaporation or condensation (the energy flow due to rainfall, photosynthesis and oxidation of living matter being negligible). Mean annual values of these components of the thermal economy are given for turf on sand and their values in % of S are tabulated for bare ground, turf, Pine plantation, meadow, and meadow with groundwater, from two N. German lowland localities.

111.8. Climatology. Climate and Microclimate

See also No. 385.

10. **Tables of temperature, relative humidity and precipitation for the world. Part I. North America, Greenland and the north Pacific Ocean. Part IV. Africa, the Atlantic Ocean south of 35° N and the Indian Ocean. Part V. Asia. Part VI. Australasia and the South Pacific Ocean.** Meteorological Office, Air Ministry, London. Nos. *M.O.* 617 *a*, *d*, *e*, *f*, 1958. pp. xi + 84 + 1 map; pp. 12 + 220 + 1 map; pp. xi + 129 + 1 map; pp. ix + 54 + 1 map. Prices 8*s.*; 20*s.*; 12*s.*; & 5*s.* 6*d.* respectively.

11. **Climatology [of arid zones]: review of research.** *Arid Zone Research, UNESCO, Paris* No. 10, 1958. pp. 190. Many refs. [E.]

Reviews of literature, presented at a symposium at Canberra in 1956: Evaporation and the water balance (*E. L. Deacon, C. H. B. Priestley* and *W. C. Swinbank*); Climatic factors in arid zone animal ecology (*F. S. Bodenheimer*); Radiation and the thermal balance (*A. J. Drummond*); Climates and vegetation (*A. Vernet*); Proprioclimates of man and domestic animals (*D. H. K. Lee*); The modification of microclimates (*E. M. F. d'Albe*); The chemical climate and saline soils in the arid zones (*E. Erikson*); and Climatological observational requirements in arid zones (*M. Gilead* and *N. Roseman*). [Cf. *F.A.* 17 No. 263.]

12. BHARUCHA, F. R., and SHANBHAG, G. Y. **Precipitation effectiveness in relation to the vegetation of India, Pakistan and Burma.** *Botanical Memoirs, University of Bombay* No. 3, 1957. pp. v + 109. 160 refs. Price *Rs.*1.50.

Analysis of the meteorological data from 104 stations in India, Pakistan and Burma, and comparison of the results with the vegetation, lead to the conclusion that Köppen's and Thornthwaite's climatic classifications fail to subdivide these countries according to their vegetation as given by Champion. The forest types can best be explained by calculating the monthly mean evaporation with the aid of Rohwer's formula as modified by Raman and Satakopan, and using these evaporation values to compute the precipitation/evaporation (P/E) ratios and the P/E indices. The P/E indices of each station can be correlated with the number of rainy days, the relation being of the type $P/E = aD + bD^2$, where a and b are constants and D = total number of rainy days in the year. The limits of the arid and semi-arid regions can be defined on the basis of computed P/E ratios. If this ratio is <1 the climate is arid, and if between 1 and 5, semi-arid. [Cf. *F.A.* 20 No. 304.]

13. HARTMANN, F. K., EIMERN, J. VAN, and JAHN, G. Untersuchungen reliefbedingter kleinklimatischer Fragen in Geländequerschnitten der hochmontanen und montanen Stufe des Mittel- und Südwestharzes. **[The effect of relief on microclimate**

in the high montane and montane zones of the central and southwest part of the Harz range.] *Forsch. u. Berat.* (*Forstw.*) *Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 3, 1958 (29–35). [G.]

A summary report of investigations to ascertain quantitative differences in radiation, temperatures etc. in relation to position on slope, aspect etc., and their role in determining the composition and distribution of plant communities.

114. Soil. Soil Science

14. PLAISANCE, G. Lexique pédologique trilingue. **[Trilingual dictionary of soil science.]** Centre de Documentation Universitaire, Paris. 1958. pp. 357. [F.] Price *Fr.*1500. I.F.B.

Contains ca. 3300 terms in French with their English and German equivalents (or near-equivalents), English and German indexes, indexes of international terms and common abbreviations, and appendices giving trilingual classifications of 20 soil characteristics etc. such as particle size, horizons and drainage.

15. LÅG, J. Undersøkelse av skogjorda i Sør-Trøndelag ved Landsskogtakseringens markarbeid sommeren 1956. **[Investigations of forest soils in S. Trøndelag in connexion with the field work of the National Forest Survey in summer 1956.]** *Medd. norske Skogforsøksv.* 15 (2) (No. 50), 1958 (187–248 + 3 maps). 24 refs. [Nor.nor.e.e.]

The factors studied were the same as in the two previous reports [see *F.A.* 17 No. 3117; 19 No. 2628]. (1) *Soil depth.* The distribution of soil by depth was similar to that in Telemark, whereas soils in Agder were usually shallower. Site class improved with increasing soil depth and gradient, and with decreasing depth of humus. Sites rich in grass and herbs, those rich in moss with herbs, and *Vaccinium myrtillus* sites with small ferns were commoner on the deeper soils; *Vaccinium myrtillus* without ferns, *Vaccinium vitis-idaea*, and *Calluna* sites were commoner on shallow soils. A thick humus layer was associated with the presence of *Sphagnum* and with *Vaccinium myrtillus* sites without ferns and *Calluna* sites. Deciduous and Spruce forests were most frequent on deep soils and those with thin humus, and Pine on shallow soils and those with thick humus. Stand age was a little higher on shallow soils and on those with thick humus. Conditions for regeneration were rather better and stand density rather greater on deep soils with thin humus. (2) *Soil types.* At least $\frac{4}{5}$ of the soils were morainic. Organic and sedimentary soils were deeper and on less steep gradients than weathered and organic soils. (3) *Soils of different mechanical composition.* Fine sand was most frequent. (4) *Stone content.* More than $\frac{4}{5}$ of the plots had a surface soil containing $< 1\%$ stone. (5) *Soil profile.* Nearly $\frac{3}{4}$ of the soils were podzolic and about $\frac{1}{6}$ were brown earths. Only 5·3% of the podzolic soils, vs. 48% of the brown earths, fell into site classes I and II. Site class tended to be lowered by increasing depth of the leached layer. Brown soils were more frequent under deciduous and Spruce forest and under eutrophic vegetation types rich in species. Stand age was generally slightly lower, regeneration conditions somewhat better and the number of trees capable of development rather higher on brown than on podzolic soils. Podzolic soils increased in frequency with increasing height above sea level and brown earths with increasing gradient. Coarse and shallow soils were frequently podzolic.

16. **Bibliography on natural radioactivity in soils and soil air (1931–1956).** *Bibliogr. Bur. Soils, Harpenden* No. 115, 1958. pp. 5. Limited distribution.

Annotated list of 24 references. [Cf. *F.A.* 20 No. 100.]

17. JASTREBOV, M. T. Estestvennaja radioaktivnost' zonal'nyh počv Evropejskoj časti SSSR. **[Natural radio-activity of zonal soils of the European part of the USSR.]** *Dokl. Akad. Nauk SSSR* 119 (3), 1958 (586–9). 16 refs. [Russ.russ.] A.P.B.

Tabulates data on radio-activity (in number of pulses/min./kg. air-dry soil) from 4 zonal soils between Moscow and the S. Crimea: (*a*) sod medium-podzolic soil under meadow on the edge of a Scots Pine forest (Moscow province), (*b*) deep chernozem under meadow-steppe vegetation (Kursk province), (*c*) ordinary chernozem under steppe vegetation (steppe zone, Dnepropetrovsk province), and (*d*) brown forest soil (semi-arid subtropical zone of S. Crimea) under Oak/Hornbeam forest, and also 2-year-old grape vines. From all these, samples were collected in June/July 1955 by mixing soil taken from 3 levels down to 55 cm. Natural soil radio-activity increased from N. to S., in direct correlation with the values for total radiation (conditioned by the content of Th, U, Ra, K^{40} and C^{14} of these soils) and also with the values for total solar radiation. Additional measurements comparing the radio-activity of (*a*) and (*b*) in an air-dry state and with a m.c. of 19·5–26% showed that when the soil was moist, radio-activity increased 2·07–2·98 times for (*a*) and 1·94–2·66 times for (*b*).

114.1 Soil Physics

See also Nos. 16–7, 33, 41–3, 46, 67, 73, 240, 522.

18. KRONTORÁD, K. Formy vody v některých lesních půdních typech. **[Forms of water in some types of forest soil.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (4), 1958 (257–82). 11 refs. [Cz.russ.g.]

Physical and mechanical analyses were made of 10 different types of forest soil, and the water forms in each investigated: viz. water statically and dynamically unavailable to the plants; immobile, semi-mobile and mobile capillary water; and free, non-capillary water. General trends in the forms of water held in the different soils and horizons are outlined, and comparisons of the soils made.

19. SETH, S. K., and YADAV, J. S. P. **A simple field-cum-laboratory method of determining soil permeability.** *Indian For.* 84 (7), 1958 (397–401 + 1 photo, 1 dgm.). 1 ref.

Describes (with scale drawings) an apparatus, essentially a hollow metal cylinder, whereby undisturbed soil columns taken in the field can be used for determining soil permeability in the laboratory.

Permeability data for soils of the demonstration area at the Forest Research Institute, Dehra Dun, are presented and discussed. The method has proved simple, accurate, and easily applied. [No indication whether the apparatus is generally available, or where it was designed.]

114.2. Soil Chemistry

See also Nos. 33–41, 43–8.

20. **Bibliography on the effect of zinc on soil and plant growth (1935–1957).** *Bibliogr. Bur. Soils, Harpenden* No. 118, 1958. pp. 37. Limited distribution.

Annotated list of 227 references including some on forest tree species.

21. JOHANNESSEN, C. **Higher phosphate values in soils under trees than in soils under grass.** *Ecology* 39 (2), 1958 (373–4). 1 ref.

Analysis of soil samples from the Sierra Nevada showed that the P content of soil solutions was significantly higher under Oak or Pine than under grass.

22. SPRINGER, U. and KLEE, J. Die Charakterisierung und Unterscheidung von Waldhumusformen mittels der Natronlauge- und Natriumpyrophosphat-Extraktion und der Stickstoff-Fraktionierung. **[The characterization and differentiation of forest humus types by extraction with NaOH or $Na_4P_2O_7$ and N fractionation.]** *Z. PflErnähr. Düng.* 80 (2), 1958 (109-26). 11 refs. [G.g.] O.R.S.

The humus types examined were the different layers containing humus from various forest humus soils (a mull under mixed hardwoods, a raw-humus moder [transition between mor and mull] under Spruce, and a podzolic soil under poor-quality Pine), and a cultivated fen soil.

23. AMBROŽ, Z. O kvantitativním a kvalitativním složení humusu v některých půdních typech, převážně lesních. II (Chemické, biochemické a fysikální rozbory huminových kyselin z různých půdních typů). **[Quantitative and qualitative composition of humus in some soil types, mainly forest soils. II. Chemical, biochemical and physical analyses of humic acids from various soil types.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 3 (1), 1957 (21–32). 22 refs. [Cz.russ.e.g.*russ.e.g.*]

Humic acids from black soils contain more C (ca. 58%) and N (ca. 4–5%) than humic acids from podzol soils and peat (51–54 and 2–3%). From 40 to 50% of the N is very strongly fixed in humic acid and does not go easily into solution during hydrolysis. Hydrolysates contain from 30 to 40% amino N. Humic acids from black soils contain a higher number of carboxyl groups and thus the absorption capacity increases in them. The hydroxyl groups are on the whole constant. The complicated structure of the humic acids of carbonate soils is exhibited in strong coagulation capacity (lower resistance to the effect of electrolysis) and greater absorption of light rays passing through. The maximum absorption starts in the region of long waves, at a length of 465 mμ. The newly formed humic acids from the same soil type are more dispersed, have a lower C content and fewer carboxyl groups, are less liable to coagulate and are weaker in absorbing light rays than are humic acids fixed by the soil. [Cf. *F.A.* 19 No. 3759.] *From author's summary.*

24. UCHIDA, T. **[The study of forest humus layers of forest soils in Hokkaido. XI. NaF soluble humic acids in the forest humus layers.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 8, 1957 (1–8). 5 refs. [Jap.e.*e.*]

From a comparison of the light absorption by extractives from destructively (*sensu* Falck) decomposed wood with that by extractives from different types of forest humus, it is concluded that the humic acids, soluble in *N*/8 NaF, from forest humus layers contain lignin decomposition products along with true humic acids (*sensu* Simon).

25. ALVSAKER, E., and MICHELSEN, K. **Carbohydrates in a cold-water extract of a Pine forest soil.** *Acta chem. scand.* 11 (10), 1957 (1794–5). 11 refs. [E.] O.R.S.

Fructose and other free sugars were identified from an extract of the F-layer.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 22–5, 45, 48, 51, 55–8, 93, 246, 361.

26. KUROTORI, T., and MATSUMOTO, H. **[Microscopical study of forest soils (I) On the method of making thin sections of soils for microscopic observation, and the application of this technique to the study of forest soils.]** *For. Soils Japan For. Exp. Sta. Meguro, Tokyo* No. 9, 1958 (1–11 + 45 photos). 8 refs. [Jap.jap.e.*e.*]

Describes the method and includes photomicrographs of such sections, illustrating soil development and showing e.g. the early stages of weathering, and the leaching and deposition of different elements of the soil. Further details and descriptions will be published later.

27. CAPSTICK, C. K. **The use of small corers for estimating the dry weight of forest litter.** *Paper, Colloquium on Research Methods in Soil Zoology, International Society of Soil Science, Rothamsted 1958,* No. 8, 1958. pp. 3. 4 refs. X.

The use of a small corer (1 sq. cm.) enabled samples of forest litter and the underlying humus layers to be taken quickly and with very little disturbance of the habitat. The results show a very low degree of scatter, considering the small weight of litter removed, and agree well with estimates based on much larger samples. *From author's summary.*

28. DIMOCK, E. J., II. **Litter fall in a young stand of Douglas-Fir.** *Repr.* from *Northw. Sci.* 32 (1), 1958 (19–29). 6 refs.

Presents data from a 45-year stand over a 6-year period, on litter variation with thinning grade, by year and by season of year. Litter fall proved to decrease with increased severity of thinning, varied significantly from year to year, and was at a maximum in October and at a minimum in late winter or early spring. Extreme low temperatures may triple the amount of litter falling in the following year.

29. **Bibliography on the decomposition of forest litter (1928–1957).** *Bibliogr. Bur. Soils, Harpenden* No. 111, 1958. pp. 25. Limited distribution.

Annotated list of 118 references.

30. MURPHY, P. W. **Forest soil investigations.** *Rep. Rothamst. exp. Sta. 1957*, 1958 (164–5).

A pilot experiment to test a technique for the determination of the rate of disappearance of Beech litter from the forest floor has proved successful. Leaves were marked with a spot of paint containing the isotope Ta^{182}, and it was possible to recover them up to about one year after marking. Leaf sampling indicated that the rate of disappearance during the first 6 months was very slow indeed, but there was probably a marked acceleration during the second 6 months.

31. MURPHY, P. W. **Radioisotope method for determination of rate of disappearance of leaf litter in woodland.** *Paper, Colloquium on Research Methods in Soil Zoology, International Society of Soil Science, Rothamsted 1958*, No. 9, 1958. pp. 6. 21 refs. X.

Details are given of an isotope-labelling technique, which makes possible the recovery of leaves of known age from the forest floor. They are marked, whilst still on the tree, with a spot of artists' oil colour to which has been added Ta^{182}, and are located on the ground with a portable Geiger-Müller detector. Preliminary observations of an experiment to determine the rate of disappearance of Beech leaf litter are given, together with a discussion of the method and the effect of radiation on insects and other invertebrate animals. *Author's summary.*

32. SLOVIKOVSKIJ, V. I. K voprosu o razloženii i vyščelačivanii list'ev drevesnyh rastenij. **[The decomposition and leaching of the leaves of woody species.]** *Dokl. Akad. Nauk SSSR* 119 (6), 1958 (1240–3). 4 refs. [Russ.] A.P.B.

Experiments in the Ukraine in 1948–50 showed that, over a period of one year, species with quickly decomposing leaf litter, including *Larix sibirica*, *Fraxinus excelsior*, *Ulmus campestris*, *Phellodendron amurense*, *Robinia pseudoacacia* and *Tilia* sp. showed considerably greater leaching of soluble substances (50–60%) as determined by leaf weight before and after decomposition than slowly decomposing species e.g. Beech (7·3%), *Quercus borealis* (20·5%), and *Q. robur* and *Pinus sylvestris* (36·5%). Mixing Larch or Ash with Oak leaf litter increased leaching to 42–48%. Data are tabulated for 30 tree and shrub species and 4 mixtures of species. Laboratory experiments over 40 days showed that, whereas *Sambucus nigra* and *Euonymus europaeus* showed more rapid leaching at the beginning that at the end of the experiment, the rate of leaching for Oak, Beech, and Hornbeam was uniform throughout. Owing presumably, to the formation of volatile products (H_2O, CO_2, NH_3 etc.) the absolute loss in weight after 40 days was ca. twice as high for *S. nigra* and *E. europaeus* as for Hornbeam and *Q. robur*, and ca. 3–4 times as high as for Beech and *Q. borealis*.

33. POHITON, P. P. Vlijanie različnyh drevesnyh porod na počvu. **[Influence of different tree species on the soil.]** *Počvoved.* 1958 (6), (49–55). 11 refs. [Russ.russ.e.] A.P.B.

In 1951–56 physical and chemical soil properties were studied under conifers, hardwoods and mixed conifer/hardwood stands of 3 forest types in the Ukraine: *subor'* (*B*), *sugrudok* (*C*) and *dubrava* (*D*), each in the 'fresh' soil-moisture class (i.e. water-table at 2·5–3·5 m.) but with differing nutrient status [cf. *F.A.* 18 No. 1407]. Soil analyses were also made under 6- to 8-year-old pure stands of 16 native and exotic species. The soil types represented were sod-podzolic soils and chernozem. Data are tabulated on density, total porosity, humus %, pH and base saturation. The effect of a given tree species varied with types of forest and soil. In (*B*) and (*C*) the favourable influence of forest on physico-chemical properties increased from pure Scots Pine, European Larch and Norway Spruce, through pure hardwoods, to mixed conifer/hardwood stands. The favourable effect of the individual species increased with age and closure of canopy. Within each forest type the favourable effect on the soil increased as the soil texture became heavier. Litter under pure Scots Pine or mixed conifer/hardwood stands with Pine predominant, contained 60–100% more N and P than that of pure Birch or Oak, or mixed conifer/hardwood stands with hardwoods predominating. N and P were liberated 1½–2 times as fast from litter under stands with hardwoods pure or predominating as from litter where conifers predominated. Some data are included on the N and P contents of litter under stands of various species at different times of year.

34. VINOKUROV, M. A., and TJURMENKO, A. N. Materialy po biologičeskomu krugovorotu azota i fosfora v lesu. **[Data on the biological cycle of N and P in the forest.]** *Počvoved.* 1958 (7), (98–103). 10 refs. [Russ.russ.e.] A.P.B.

Briefly outlines the differing views of Remezov and Tjulin on methods of studying the biological cycle of nutrients in the forest. Against this background, data are presented on the variations during the summers of 1955–56 in the humus, N and P contents, and the C/N ratio of podzolic soils under three trees each of Pine, Birch and Lime. In all cases the humus, N, and P contents of the top soil layers decreased during the first half of the growing season, reaching a minimum in late June–July, i.e. during the period of maximum growth and corresponding to the period of fruit formation in Lime. In the second half of the summer the contents of humus, N and P increased. Analyses of roots and leaves of Lime at intervals from 5 May to 25 August lead the authors to conclude that: (1) the roots took up N and P from the soil only until the end of June or beginning of July, after which the aerial parts of the tree drew these elements only from supplies in the root system itself. (2) The increase of N and P in the soil in the latter half of the summer appeared to be brought about both by decomposition of some of the root-hairs and by root exudations. (3) At the end of the season, when growth had ended and the fruits had formed, N and P increased in the roots as well as the soil; this is attributed to their transfer

from the upper parts of the plant and the causes given at (2). A rough estimate from the data suggests that the total loss of N from the top 3–13 cm. of soil under Lime by late June was equivalent to 825 kg./ha., and that of P to 130 kg./ha. These figures are of the same order as those of Tjulin. [Cf. *F.A.* 16 No. 212.]

35. SKRYNNIKOVA, I. N. O sovremennyh počvennyh processah v južnoj časti lesnoj zony. **[Contemporary soil processes in the southern part of the forest zone.]** *Počvoved.* 1958 (4), (1–13). 20 refs. [Russ.e.] A.P.B.

In 1945–50 analyses were made of soil solutions from 4 sites in Moscow province: sod strongly-podzolic soils under (*a*) Spruce, (*b*) grass field, and (*c*) Oak, and (*d*) strongly podzolic soils under Spruce (*Oxalis* type). The samples were collected by horizons down to a depth of 110–120 cm. Data on chemical properties of the soils and soil solutions are shown in tables and graphs. The composition and concentration of organic and mineral substances of the soil solution are strongly influenced by the vegetation cover. Under conifers and moss cover, the main products of litter decomposition are non-volatile organic acids and their salts, which enter the soil solution; the higher the rate of decomposition, the more acid and the more concentrated the soil solution of the A_0 and A_1 horizons became. The main products of litter decomposition in (*b*) and (*c*) are Ca and NH_3 salts of organic acids, $Ca(HCO_3)_2$ and free CO_2. Under favourable conditions these make the soil solution more alkaline, but if diffusion of CO_2 into the atmosphere is prevented by an over-wet surface horizon, the CO_2 remains and acidifies the soil solution. Although the morphology of the profile and the extremely low proportion of the clay fraction in the top 30 cm. point to intensive and prolonged podzolization in these soils, the process is considered to have been arrested under broad-leaved forest, meadows and pastures. Under these vegetation types there occurs a sod-forming process characterized by a biologically active humus layer, almost complete absence of free non-volatile organic acids in the soil solution down the profile, and a secondary accumulation of the clay fraction in the top 10 c.m. Under coniferous forest with moss cover the podzolic process still occurs to some extent.

36. SMIRNOV, V. N. Dinamika pitatel'nyh veščestv i biologičeskoj aktivnosti podzolistyh počv južnoj polosy lesnoj zony. **[Variations of nutrient substances and biological activity of podzolic soils of the southern part of the forest zone.]** *Počvoved.* 1958 (7), (58–65). 15 refs. [Russ.russ.e.] A.P.B.

[Cf. *F.A.* 17 No. 1132.] Presents and discusses data on the contents and seasonal variations of NH_3, P, and K in the A_0 and A_1 horizons and on CO_2 production by the soil, during the growing season of 1953 on two soil types: (*a*) a podzolic sandy soil, and (*b*) a sod medium-podzolic light clay-loam, at Yoshkar-Ola, Mari A.S.S.R. The types of cover represented on (*a*) were dry Pine/lichen type forest, *Calamagrostis epigeios* on a clear-felled site, and a glade with bushes of *Cytisus ratisbonensis* and Willows; on (*b*) a 60- to 80-year mixed Spruce/Lime/Oak stand with a shrub layer, an adjacent nursery with 4-year-old Pine, and a clover field. Contents of the nutrients studied, and CO_2 production, were higher and showed more seasonal variation in (*b*) than in (*a*). Apart from traces in May–June, nitrates and nitrites were not detected in either soil. Differences in soil and vegetation were most clearly reflected in biological activity of the soil as indicated by CO_2 production, which appears to be a sensitive indicator of differences in soil formation and properties affecting growth. The A_0 horizon of the forested soils showed higher nutrient contents, with greater seasonal variation, than the A_1. Some measures for improving the nutrient status and biological activity of such soils are mentioned, e.g. loosening of the A_0, introduction of leguminous plants, e.g. *C. ratisbonensis* for dry Pine sites and *Caragana arborescens* for moister sites.

37. VERIGINA, K. V. K harakteristike počvoobrazovanija pod lesom i pašnej v Kaliningradskoj oblasti. **[Soil formation under forest and ploughed land in Kaliningrad province.]** *Počvoved.* 1958 (5), (22–32). 13 refs. [Russ.russ.e.] A.P.B.

Analyses were made in May–Sept. 1950 in Kaliningrad province, of soils and the soil solution from (*a*) 60-year-old Spruce (*Piceetum hylocomiosum* type) on sod-podzolic soil, (*b*) cultivated sod-podzolic soils (25- to 27-cm. ploughed layer) at a distance of 200 m. from the forest, believed to have been drained and brought into cultivation about 1927–29. Soil under (*a*) showed marked podzolization of the upper horizons, with a low base content and an accumulation of SiO_2. The soil solution in this soil varied throughout the profile, but showed little change with time during the period of study; in the upper layers it contained greater amounts of soluble organic substances than of mineral constituents and no NO_3 was detected; even in the accumulative layer, it showed an acid reaction despite the accumulation of Ca, and divalent Fe was always present (trivalent Fe was also present, in combination with organic substances). In (*b*) there was less differentiation of the profile, and the ploughed layer was uniform in chemical and mechanical composition. The soil solution had a more uniform composition in the upper parts of the profile, but varied more with season; its mineral content exceeded that of organic substances and was especially high in spring owing to rapid nitrification and accumulation of $Ca(NO_3)_2$; its reaction was more or less neutral, and it contained neither di- nor trivalent Fe. No nitrates were found in either the litter or soil under (*a*). The complete absence of nitrification in this soil, and the intensive nitrification under (*b*) indicate significant differences in soil formation. N was present in the soil solution of both as NH_4 with a slightly higher amount under (*a*) than under (*b*).

38. VAJČIS, M. V. K voprosu o vlijanii listvennicy evropejskoj na izmenenie dernovo-podzolistyh počv. **[The influence of *Larix decidua* in changing sod-podzolic soils.]** *Počvoved.* 1958 (5), (12–21). 25 refs. [Russ.russ.e.] A.P.B.

Soil analyses were made under 3 stands each of

Larch (20–25 and 105 years old) and Spruce (30 and 95–100 years old) growing on sod-podzolic soils in Lithuania. Data on the accumulation, ash content and decomposition of litter, and the physical and chemical properties of the soil (to 70 cm.) under both species are compared. Larch litter decomposes faster than that of Spruce and the ash elements thus liberated, particularly Ca and Mg, are fixed by the soil, lowering its acidity and increasing its base saturation. The roots of Larch penetrate deeper, thereby improving the permeability of the soil to water and promoting the mobilization of Ca from the underlying layers and the neutralization of the organic acids formed during litter decomposition. Under Spruce, the soil layer involved in the nutrient cycle is limited to 50–60 cm.; greater leaching of the ash elements, in combination with high contents of H and Al ions, leads to increased podzolization and accumulation of SiO_2. The author concludes that under the influence of Larch these sod-podzolic soils of light mechanical composition overlying calcareous clay-loam are evolving in the direction of the brown forest soils.

39. OVINGTON, J. D. **Studies of the development of woodland conditions under different trees. VII. Soil calcium and magnesium.** *J. Ecol.* 46 (2), 1958 (391–405). 18 refs.

[Cf. *F.A.* 19 No. 3756.] Three forest sites at West Tofts, Bedgebury and Abbotswood were examined to determine the effects of afforestation on exchangeable Ca and Mg in the soil. The litter layers contained large amounts of both, the greatest accumulations being under conifers. There was no evidence of a significant change in the Mg content of the soil as a result of tree growth, but the exchangeable Ca, particularly in the surface soil layers, decreased as a result of afforestation. The effects of different tree species on Ca content of the soil varied considerably, but Ca loss was not significantly greater under conifers than under hardwoods, or under exotics than under native species. *From author's summary.*

40. KARSCHON, R. **The influence of *Eucalyptus camaldulensis* Dehn on soil development in coastal areas.** [*Docum.*] *3rd Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/EU/15-Ca*, 1958. pp. 6. 10 refs.

Soil samples taken at 10 and 50 cm. depth in an 8-year roadside plantation near Tel-Aviv, 1100–1400 m. from the sea, on calcareous, loamy sand, indicated that cation-exchange capacity was greater than in the open. The amount (though not the %) of exchangeable K was higher, and the pH lower than in controls on open ground. Amounts of Na and Cl were higher in one of the 3 sampled spots inside the stand than in the open, presumably because of interception of salt nuclei and leaching of saline litter; at 25 m. (5 heights) to leeward (inland) they were not lower than at 50 m. to windward (seaward).

41. REMEZOV, N. P. O sootnošenii meždu biologičeskoj akkumuljaciej i éljuvial'nym processom pod pologom lesa. [**The relationship between biological accumulation and the eluvial process under forest cover.**] *Počvoved.* 1958 (6), (1–12). 6 refs. [Russ.e.] A.P.B.

In the Voronezh State forest nature reserve, on sites where the grey-brown forest soil (a loamy sand) is underlain at 1–2 m. depth by a practically impermeable silty clay, the author has used a type of lysimeter in which only side walls are employed to isolate the plot and the clay forms a natural bottom. The first installation was constructed in 1953 to enclose 35 sq.m. of Oak/Norway Maple, with mixed hardwood regeneration, an underwood of Hazel and *Acer tataricum*, and *Aegopodium podagraria* with its associates in the ground layer. Data are given on the amounts and chemical analyses of the groundwater flow for the years 1954–57, and also on the water content of the snow cover before the spring melt. Results showed that water derived from precipitation reaches the impermeable layer only in the snow-melt period, so that removal of solutes from the profile by groundwater flow is possible only in spring. The incidence, amount and composition of this flow vary from year to year with the weather. The pH of the groundwater ranged from 7 to 7·8. Its content of Ca varied from 21–30 mg./litre (in 1957) to 105–226 (in 1954), and of K from 0·1–4 (in 1957) to 9–26 (in 1956). The total losses of Ca and K increased considerably in years when the flow began late, i.e. after soil microbiological processes had started. The Ca concentration decreased as the volume of flow increased. The Al concentration varied from 5·4–9·3 mg./litre (in 1954) to 16·3–24·2 (in 1957) and was higher in years when the flow started early. The amount of Al removed increased with the volume of the flow. P was present only in trace or near-trace concentrations. In soil water collected at various depths under Oak by Popov lysimeters the K content at ca. 20 cm. was much higher (72 mg./litre) but decreased downwards through the profile. In spring the Ca and Si contents of the soil water were much lower than those of the groundwater, hence in the latter these elements may have been derived from lower horizons into which they may have been washed down in autumn. Similar studies were made in 1956–57 under Aspen/Maple (*Aegopodium/Carex* type) forest; results [no details given] were similar, the chief difference being the lower Ca and K concentrations and more acid reaction. When the amounts of elements in the groundwater flow are expressed as a % of the amounts received by the soil from decomposing vegetation, the following descending scale of relative mobility, valid for both Oak and Aspen forest under these conditions, is obtained: Al > Ca > K > Si > P. Analyses were also made in 1955–57 of water from rivulets in catchments carrying stands of Oak, Aspen or Pine. For Oak, the results were similar to those for the groundwater. The main differences between species were in Ca and Al content of the water, which decreased in the order Oak, Aspen, Pine. Rivulets from Pine forest were more acid than those from the other species. [Cf. *F.A.* 18 Nos. 1233–4.]

42. CERNYŠEVA, A. P. Vlijanie lesnyh nasaždenij na nekotorye vodno-fizičeskie svojstva černozemov.

[The influence of tree plantations on some hydrophysical properties of chernozems.] *Počvoved.* 1958 (6), (115–8). [Russ.e.] A.P.B.

Soil structure and permeability were studied on N. and S. gully slopes in the Rostov province, with a soil cover (where not eroded) of Ciscaucasian chernozems, and transitions from these to southern chernozems under (*a*) coppiced Oak/Ash plantations and (*b*) steppe vegetation. The upper soil horizons had a better structure under (*a*) than under (*b*), the % of water-stable soil aggregates increasing under (*a*) as the density of the tree cover increased, but in the lower horizons (below 50 cm.) structure was better under (*b*). Infiltration capacity and porosity increased with improving structure of the upper horizons. The poorer structure of the deeper horizons in (*a*) does not impair permeability since adequate drainage is provided by the deep penetration of the larger tree roots.

43. Pelíšek, J. Půdy boubínského pralesa a jeho okolí v oblasti Šumavy. **[The soils of the Boubin virgin forest and of its surroundings in the Šumava.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (1), 1958 (21–38). [Cz.russ.g.]

The Boubin forest consists of Silver Fir and Spruce with some Beech on chocolate-brown soil, while the managed forests near by are predominantly Spruce with some Fir on rust-brown forest soil. The two soils show no striking difference in physical, chemical and microbial conditions, but humification is much better in the former, and humus contents of its main horizons (from topmost to lowest) are 33, 7·5, and 3·5% compared with 13, 3·4 and 1·3% in the latter.

44. Manil, G. L'humus forestier (2me partie). Une première application: la classification des sols forestiers. **[Forest humus: Part 2. A first application: the classification of forest soils.]** *Bull. Soc. for. Belg.* 65 (8/9), 1958 (577–602). 9 refs. [F.]

Classifies Belgian forest soils on the basis of humus types [cf. *F.A.* 18 No. 1236].

114.4. Soil Classification. Soil Types

See also Nos. 4, 11, 18, 35–6, 38, 43–4, 77–8, 1294.

45. Dimitrieva, N. V. O buryh lesnyh počvah Kodr. **[Brown forest soils of the Kodry.]** *Počvoved.* 1958 (7), (103–12). 18 refs. [Russ.russ.e.] A.P.B.

Tabulates results of analysis of brown forest soils (brown earths) of the Kodry [hills?], Central Moldavia, under ploughed land and under Oak/Hornbeam-type forest. Soil-forming processes are described. The soils have a high base saturation and are particularly suitable for broadleaved forest.

46. Tyškevič, G. L. Počvy pod elovymi lesami Karpat. **[Soils under Spruce forests of the Carpathians.]** *Počvoved.* 1958 (2), (27–9). 8 refs. [Russ. russ.e.] A.P.B.

Tabulates data from mechanical and chemical analysis of brown earths carrying Spruce on 4 sites (up to 1380 m. alt.) in the Transcarpathian and Stanislavsk provinces. Spruce grew best at >1100 m. alt. on N. aspects with a slope of ca. 20° where the soil was a medium clay-loam 70–80 cm. deep, with a good crumb structure and high base saturation (40–45%). At higher altitudes both texture and nutrient status of the soil deteriorated.

47. Panin, P. S. Osnovye tipy počv Džungarii i prilegajuščih gor Tjan′-Šanja i Altaja. **[The main soil types of Dzungaria and the adjacent Tien Shan and Altai mountains.]** *Počvoved.* 1958 (3), (51–6). 10 refs. [Russ.russ.] A.P.B.

Presents data from studies in 1956 and discusses the humus content and chemical composition of the main soil types of Dzungaria (N. Sinkiang, China) and the mountain ranges of Altai and Tien Shan (U.S.S.R.). Under Spruce growing in patches on N. slopes of ravines and elevations in the mountains, grey forest soils and sod-podzolic soils with a cinnamon-brown colouring are found. Under steppe vegetation on S. slopes, chestnut earths and leached cinnamon-brown soils occur. [Cf. *F.A.* 11 No. 850.]

48. Zaboeva, I. V. Gleevo-podzolistye počvy. **[Gley-podzolic soils.]** *Počvoved.* 1958 (3), (24–33). 18 refs. [Russ.russ.e.] A.P.B.

Presents data from mechanical and chemical analyses of the gley-podzolic soils of the forest tundra and N. taiga regions of the U.S.S.R. and describes characteristic processes of soil formation.

49. Nakata, I. **[Studies on the soil of Tomakomai District [Hokkaido].]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 8, 1957 (9–26). [Jap.jap. e.e.]

Describes, with tabulated data, immature volcanic soils, classified on gravel size, which varies with distance and direction from volcanic centres. The distribution, on this classification, of the coniferous, mixed, and hardwood forests, their proneness to cyclone damage, the humus types, and conditions for regeneration are also detailed.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 62, 223, 244, 297, 486, 518, 861–6.

50. Einspahr, W., *et al.* **Coal spoil-bank materials as a medium for plant growth.** *Repr.* from *Proc. Iowa Acad. Sci.* 62, 1955 (331–44). 8 refs.

A chemical and physical analysis of spoil from Iowa coal strip-mining. Field trials [no details] suggested that *Pinus virginiana*, *P. rigida*, *Juniperus virginiana*, *Fraxinus pennsylvanica*, *Populus deltoides*, *Ulmus americana*, *Platanus occidentalis* and *Robinia pseudoacacia* are promising for some of the acid or toxic shales unsuitable for other crops. [Cf. *F.A.* 20 No. 469.]

51. Bibelriether, H., and Sperber, G. S. Diluviale Bodenbildungen im Spessart. **[Diluvial soil formations in the Spessart.]** *Allg. Forstzeitschr.* 13 (30), 1958 (421–4). 12 refs. [G.]

Discusses the layers of highly plastic pottery clays originating from diluvial solifluction, found usually at depths of 1·2–2 m., mainly on S., S.W. and S.E. slopes, their beneficial effect on the water régime and the nutrient status of sites, and particularly on the growth of Larch.

52. BINNS, W. O. **Effects of tree growth on soil: tree growth on deep peat.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (96–7).

A vigorous stand of Lodgepole Pine on the Lon Mor, fertilized with mineral phosphate, has been found to deplete the nutrient reserves of the peat considerably, particularly supplies of K and inorganic P, and it is possible that the yellow colour of the foliage observed in large trees of several species growing on the peat may be due to K deficiency. A fertilizing trial to test this has been laid down in Lodgepole Pine and Sitka Spruce, and the possibility of using granite dust as a slow-acting K fertilizer is being studied.

114.6. Soil Biology

See also Nos. 29, 36, 248–56, 706.

53. SEJFERT [SEIFERT], J. Ispol'zovanie fluorescentnoj mikroskopii v mikrobiologii počvy. **[The use of fluorescence microscopy in soil biology.]** *Počvoved.* 1958 (2), (50–4). 8 refs. [Russ.e.] A.P.B.

Fluorescence microscopy was used to determine differences in soil microbiological activity in soils under different cover types. The number of soil bacteria and the rate of nitrification were considerably greater under a lightly thinned 30-year Birch stand than under 80-year Spruce or herbaceous cover [location and soil unspecified]. In similar studies on a rendzina in the Karlštejn district of Czechoslovakia, more soil micro-organisms were found in the *Quercetum lanuginosae*, the climax for the region, than in the *Querceto-Carpinetum* or grass. This method shows that bacteria are present in the soil in numbers considerably greater than those previously quoted in literature as the maximum.

54. DOBBS, C. G., and BYWATER, J. **Mycostasis in soils.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (92–4).

Investigations have begun at Bangor with the aim of elucidating further the phenomenon of the inhibition of germination of fungal spores and of the growth of hyphae in soils. Previous work at Bangor is summarized [cf. *F.A.* 15 No. 32]. A start has been made with assaying and comparing soils in respect of their inhibiting power, and 3 levels of mycostasis in soils can now be distinguished. There is some indication of seasonal variation in inhibiting power.

55. MIKOLA, P. **Studies on the decomposition of forest litter by Basidiomycetes.** *Commun. Inst. for. Fenn.* 48 (2), 1956 (1958). pp. 22. 33 refs. [E.fi.]

Tabulates and discusses the results of laboratory experiments showing: (1) loss of weight and colour change of Pine-needle and Aspen-leaf litter in 107 days when decomposed by 34 different fungi; (2) loss of weight and change of pH in litter of 25 tree and ground-flora species after 111 and 157 days under the influence of 3 different fungi. The ability of different fungi to break down litter varies greatly; many basidiomycetes, e.g. species of *Marasmius*, *Mycena*, *Collybia*, *Hypholoma* and *Stropharia* are very effective. Most of the saprophytic basidiomycetes decompose both cellulose and lignin. The most effective species usually prefer lignin, this preference being indicated by loss of colour and rise in acidity of the litter. Some species, however, e.g. *Laccaria laccata*, are incapable of decomposing lignin, and their activity gives rise to a darkening of the litter and decreasing acidity. The bearing of these findings on the factors affecting the formation of mull and mor is discussed, and it is concluded that they support the view that differences between mull and mor are not caused by different rates of decomposition, since the organisms that carry out decomposition in mor, mainly basidiomycetes and other fungi, are at least as effective as the micro-organisms of mull.

56. GILBERT, O., and BOCOCK, K. L. **Some field and laboratory methods being used to study the litter fauna.** *Paper, Colloquium on Research Methods in Soil Zoology, International Society of Soil Science, Rothamsted 1958*, No. 7, 1958. pp. 5. 10 refs. X

Nylon netting has many advantages over materials previously used to contain samples of litter in the field, and some examples of its use are given. The metabolic differences between mull and mor reflect the activity of large litter-feeding invertebrates on mull. A method is outlined for rapid but gentle drying of litter before chemical and nutritional analysis. *From authors' summary.*

57. DRIFT, J. VAN DER. **The soil fauna in an Oakwood forest with different types of humus formation.** *Paper, Colloquium on Research Methods in Soil Zoology, International Society of Soil Science, Rothamsted 1958*, No. 6, 1958. pp. 2. X.

A study was made of the soil fauna occurring in 3 types of humus that have developed in a small Oak coppice with some Birch, Poplar and Alder, on a loamy sand in Gelderland. These types are: (*a*) mull, where the litter is decomposed within a year and the humus mixed thoroughly with mineral particles in the upper horizon; (*b*) mull-like moder, with a fairly complete breakdown of litter, but with fragments of litter in the upper horizon; and (*c*) mor, where the breakdown of litter is not completed within the year, and there is a thick layer of litter and amorphous humus on top of the mineral soil. It was found that saprophagous groups were relatively scarce in (*c*), 5 saprophagous groups predominated ($> 50\%$ of the total catch) in (*a*), and 2 groups occurred in (*b*). The predaceous groups occur evenly in the 3 types. All mite groups predominated in (*c*) and were unimportant in (*a*).

58. MÄRKEL, K. Die Einwirkung des Klimas auf die Oribatidenfauna des Rohhumus. **[The influence of climate on the oribatid fauna of raw humus.]** *Naturwissenschaften* 45 (10), 1958 (248–9). 5 refs. [G.] O.R.S.

A study in Spruce stands showed an increase in number, and in number of species, in the F layer in the warmer drier regions, but a decrease in the litter layer. Detailed results will be published elsewhere.

59. NEVES, C. M. BAETA, and GRAÇA, C. J. BRANDÃO DA. Nota sobre a mesofauna (Acarina) dos solos florestais de Portugal. **[Notes on the mesofauna (Acarina) of the forest soils of Portugal.]**

Portug. Acta biol. 6*B* (1), 1955/1957 (40–3). 6 refs. [Port.] O.B.D.

Lists Acarina found in soil samples taken from under *Pinus pinaster* in the Serra de Sintra.

60. CARD, L. C. **The Acarina of a Hemlock/Yellow Birch forest floor.** *Abstr. of thesis*, in *Dissert. Abstr.* 18 (6), 1958 (2275–6). O.R.S.

An investigation was made of population fluctuations, vertical and horizontal distribution, and feeding habits of mites of a Hemlock/Yellow Birch forest floor at Imp Lake, Michigan. The mites were the most abundant mesofaunal element in this locality. Variations in the nature and structure of the soil profoundly influenced their distribution. Most species showed a low tolerance to dry conditions, but moisture acted as a limiting factor only in the upper portions of the litter. Both vertical and horizontal distribution of the mites were influenced by food habits. Temperature changes were more effective in winter when some movement of individuals from litter to humus occurred as a response to unfavourable temperature conditions in the litter. Extremes of temperature acted as limiting factors for population size. Factors influencing mortality included activity of predators, fungal infections, fungal capture, high temperatures and low moisture. Four groups of soil mites were represented in the collections made: Oribates, Mesostigmata, Trombidiformes and Acaridiae, comprising 74 genera. The dominant species was *Oppia neerlandica*; frequently occurring species included *Peloribates* sp., *Scheloribates pallidulus*, *Brachychthonius lapponicus*, *Phthiracarus borealis*, *Mesoplophora pulchra*, *Asca* sp. and *Gamasolaelaps* sp. A variety of litter and humus material was consumed, all stages of organic decay providing food for some species. The significance of mites in the decomposition process lies in their selective effect.

61. POOLE, T. B. **Soil collembola in a Douglas Fir plantation.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (109–11).

The soil collembolan population in a 25-year plantation with no ground flora was estimated at a minimum of 47,000/sq.m. The organic layer, including both litter and humus, was ca. 1 in. deep and contained 85% of the population. The larger forms feed on soil fungi and occasionally on leaf litter, whereas the smaller forms appear to feed directly on the humus.

62. SATCHELL, J. E. **Earthworm biology and soil fertility.** *Soils & Fertil.* 21 (4), 1958 (209–19). 188 refs.

Reviews the more important papers on the subject and suggests points on which further research might be profitable. Earthworm populations; their feeding and casting behaviour; their effects on soil structure and chemistry; their influence on crop yields; and the extent to which they are affected by agricultural practice, are discussed.

63. HANSCHKE, D. Bericht über die Ergebnisse der bisherigen Untersuchungen über die Regenwurmfauna in verschiedenen Waldgesellschaften. **[The earthworm faunas of different forest plant communities.]** *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 3, 1958 (16–29). 2 refs. [G.g.]

A summary of a synecological study of earthworm species and density (in g. earthworms/cu.m. soil) on 22 sites in the Central German mountains, differing in composition (Beech and Oak preponderating), plant-sociological position, soil, moisture, altitude etc. At the lower altitudes (300–400 m.) correlation of density with pH and base content was close, particularly in the A horizon, though it was also affected by other factors, including excessive moisture and gley conditions. In the zone between ca. 400 and 500 m., the correlation was weaker, temperature being the chief ecological factor. Density declined with increasing altitude. In two stands at ca. 900 m., both Spruce with thick raw-humus layers, no earthworms were found. In general, sites with rich, varied vegetation were also rich in earthworm species. Plots on compacted loess-loam, which had been fertilized with 2000 kg. CaO/ha., showed an increase in mean density from 7 to 20 g./cu.m. over 3 years under Beech and from 0 to 3 g. under Spruce.

116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 1, 9, 11, 41–2, 234, 470–1, 474–7, 526, 624.

64. RAFI, M. **Forest lands and watershed management [in Pakistan].** *Pakistan J. For.* 7 (4), 1957 (301–4).

A brief summary of forest types, relations of forestry to the water economy and soil conservation etc.

65. BAY, R. R. **Cutting methods affect snow accumulation and melt in Black Spruce stands.** *Tech. Note Lake St. For. Exp. Sta.* No. 523, 1958. pp. 2.

Cutting narrow E.-W. strips in Black Spruce forests in N. Minnesota in winter resulted in a high total accumulation of snow and a reduced rate of melt in spring by comparison with clear-felled sites or large openings in the stand. The water content of the snow pack for each cutting method is tabulated.

66. BAY, R. R. **Forest type affects snowpack.** *J. Soil Wat. Conserv.* 13 (3), 1958 (129–30).

In 1937 a large area of brush and inferior Aspen was planted to Red Pine in N. Minnesota. After thinnings in 1956, b.a. was 14 sq. ft. on 746 trees per acre. Snow depth and water content were measured 10 times between Feb. and April 1956 in the plantation and in the adjacent Aspen area. The Pines, in contrast to the Aspens, prevented the accumulation of deep snow, but during the spring thaw the snow disappeared more quickly from the latter. The conversion of inferior Aspen areas to Red Pine may therefore result in a greater retention of snow late in spring and prolongation of its melting.

67. SKORODUMOV, A. S. Vodnyj režim suglinistyh počv lesnyh nasaždenij stepi i lesostepi. **[The water régime of clay-loam soils under tree**

stands in the steppe and forest-steppe.] *Počvoved.* 1958 (3), (67–75). 15 refs. [Russ.russ.e.] A.P.B.

Attempts to deduce some broad generalizations from the results (where comparable) of Russian investigations of the water régime of soils and subsoils under forest in the forest-steppe (*a*) and steppe (*b*) regions of the U.S.S.R., tabulating data on depth of wetting, water storage in spring and autumn, and water consumption during the growing season, for 16 localities in the area stretching from Kursk to the S. of the Ukraine and E. to Kuibyshev. Concludes that the total turnover of soil water under tree stands, i.e. the total amount of water received by and lost from the soil and subsoil, is considerably greater in (*a*) than in (*b*). The mixed Oak woods of (*a*) probably lose 150–200 mm. more water to the atmosphere during the growing season than the Oak plantations in (*b*), and water deficiency is the primary factor responsible for the poor growth of the latter as compared with the former. Within region (*b*) the total turnover of water in the soil and subsoil decreased in passing from ordinary chernozems to dark-chestnut soils, but there are some exceptions. The occurrence of a soil layer of permanently low moisture content (drier than the layers above and below, even in wet springs) is characteristic of soils under forest in the steppe and the southern part of the forest-steppe.

68. REIGNER, I. C. **Prediction of streamflow for single-watershed calibration.** *Abstr.* in *Trans. Amer. geophys. Union* 39 (3), 1958 (528). H.S.B.

Six years' daily stream flow, precipitation, and temperature data were used to develop equations for the prediction of monthly and annual run-off, and peak flow from a 1500-acre scrub Oak catchment in N.E. Pennsylvania. Standard errors were used to determine the length of stream flow records necessary to detect small differences in flow caused by converting the scrub Oak cover to a high forest of mixed conifers and better hardwoods. Monthly stream flow was predicted, using a weighted and exponential expression of monthly precipitation and an estimate of storage at the beginning of the month. The latter parameter was derived from an antecedent precipitation value and antecedent temperature. Annual stream flow prediction was based on the water-balance equation: run-off = precipitation −water loss ± storage change. An equation was derived, using the following independent variables: annual precipitation, mean annual temperature, and estimated storage change, the last being the difference between initial and final storage, both derived as above. Peak flows were estimated from a multiple regression involving storm precipitation weighted on an hourly basis and a total storage factor derived as above.

69. **Interpreting Coweeta water-yield results.** *Rep. Stheast. For. Exp. Sta. 1957*, 1958 (65–7).

The experiments on Watershed 17, where clear felling and annual cutting of regrowth have resulted in increased, well regulated stream flow for ca. 18 years, are taken to demonstrate, not the unimportance of forests for catchment protection, but their rôle in creating optimum soil conditions. Slight changes in plant composition etc. point to a possible onset of deterioration. Elsewhere, such treatment might be dangerous.

70. HEWLETT, J. D. **Pine and hardwood forest water yield.** *J. Soil Wat. Conserv.* 13 (3), 1958 (106–9). 4 refs.

Describes the aims of a long-term experiment, initiated in 1955, for converting native hardwoods to White Pine on two mountain catchments covering 70 acres in the S. Appalachians, N.C. Notes are given on the different ecological conditions found on small test plots, planted in 1945 and now carrying Pines up to 25 ft. high, and on the hardwood sites.

71. GOODELL, B. C. **A preliminary report on the first year's effects of timber harvesting on water yield from a Colorado watershed.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 36, 1958. pp. 12.

In 1954–56, fellings were made on the 278 acres of the Fool Creek water catchment (Frazer Experimental Forest, Colo.), carrying 250- to 300-year Lodgepole Pine, Engelmann Spruce and Subalpine Fir, following 11 years' records of stream discharge in this and the adjacent catchment of East St. Louis Creek. The timber was harvested by clear-felling strips 1, 2, 3 or 6 chains wide, each alternated with uncut strips of equal width. Stream-flow was estimated to have increased by ca. 250 acre-ft. in 1956, and 200 acre-ft. in 1957. The spring-flood peak discharge increased the first year after cutting and decreased in the second year in comparison with control. Sediment yields since the cutting have been low. Width of clear-felled strip had no effect on snow accumulation. [Cf. *F.A.* 13 No. 3577; 15 No. 40]. Further studies are needed to estimate long-term effects.

72. BETHLAHMY, N. **Logging and surface runoff.** *Abstr.* in *Trans. Amer. geophys. Union* 39 (3), 1958 (506). H.S.B.

Modern logging techniques affect the hydrology of catchments. Investigations have shown that permanent roads improperly located and poorly constructed increase turbidity and disturb the regularity of stream flow. The effect of skidding roads is not so well understood, but good planning and attention to drainage may minimize harmful effects. Severe burns reduce soil infiltration rates, but such burns normally occur on only a small portion of the logged area.

73. ISHIKAWA, M. **[On the infiltration index of forest soil.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 8, 1957 (158–67). 5 refs. [Jap.e.*e.*]

A study of the infiltration of light rains into the soils of conifer/hardwood and conifer forest, and Bamboo grass [?*Phyllostachys bambusoides*] 1 m. high on former forest soils, made with a modified Rocky Mountain infiltrometer over a 3-year period. Litter and duff were 4 cm. deep, slopes 9–45° and soils loam or clay-loam. The final infiltration index ϕ (mm./hr.) was expressed by the linear function of rainfall intensity, i, viz: $\phi = ki$ $(1–k)$ ϕ_0, where k and ϕ_0 are constants representing respectively the area ratio of no run-off, and the critical rainfall intensity sufficient to initiate run-off

(here 30–50 mm./hour). Experimental values of k with the litter undisturbed were 0·8–0·9, and about 0·7 in plots with cover. They dropped to 0·2–0·3 when water fell direct on the B horizon. About 10% of the rainfall from intense rainstorms of short duration would reach watercourses in or adjacent to the forest. Values of ϕ are tabulated for i of 20, 40 . . . 120 mm./hour for the above soils.

74. PONTE, M. BARREIRA DA. Défense des sols contre l'érosion et repeuplement par le chêne-liège des zones du carbonifèrien du sud-ouest du Portugal. **[Erosion control and re-planting with Cork Oak in the carboniferous zones of S.W. Portugal.]** [*Docum.*] *4th Sess. Wkg. Party on Cork Oak FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/LG/3-Bd*, 1958. pp. 6. [F.] Limited distribution.

Describes the erosion in this region, caused mainly by intensive cultivation of cereal crops on shallow soils, and the methods now being used to overcome it by improving and extending Cork Oak stands: (1) preserving the protective maquis in contour strips, and planting Cork Oak in alternate cultivated strips; (2) terracing where the terrain permits.

75. SACCARDY, L. Les méthodes de défense et restauration des sols en Algérie. **[Soil conservation methods in Algeria.]** [*Docum.*] *6th Sess. FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/65-C Add.* 1, 1958. pp. 6. [F.] Limited distribution.

76. HALDEMANN, E. G. **Recent landslide phenomena in the Rungwe volcanic area, Tanganyika.** *Repr.* from *Tanganyika Notes and Records, Dar es Salaam* No. 45, 1956 (3–14). 7 refs.

Discusses the geological aspects, with sketch; types of mass movements (of which those discussed are debris-avalanches, a liquefaction flow and a major landslide); passive conditions; and active causes. Among the latter are clearing of vegetation and faulty cultivation. Cypresses, *Cedrela*, Pines and Eucalypts should be planted on the lowest parts of these slides.

77. STANNARD, M. E. **Erosion survey of the South West Cobar Peneplain. II Soils and vegetation.** *J. Soil Conserv. Serv. N.S.W.* 14 (1), 1958 (30–45). 6 refs.

Describes the main soil types, and discusses the distribution of the plant associations: (1) *Eucalyptus populifolia/Callitris glauca*, (2) *Acacia/Eremophila*, (3) *Eucalyptus oleosa/E. dumosa*, (4) *Casuarina heterodendron*, (5) *Eucalyptus dealbata/E. sideroxylon*, (6) *E. bicolor*. The relationship between topography, soils and vegetation is shown in a table. Some data are given on tree regeneration.

78. TAYLOR, A. C. **A soil conservation survey of the Snowy [River] catchment. II. Soils, vegetation and land use.** *J. Soil Conserv. Serv. N.S.W.* 14 (1), 1958 (5–23). 4 refs.

Data are given on the 6 major soil complexes and those properties that relate to erodibility are discussed. The principal vegetation types are briefly described, with comments on their economic value, susceptibility to damage by the various land-use patterns and their influence on erosion; they include: sub-alpine, savanna and tall woodland, dry and wet sclerophyll forest, and dry scrub. The relationship between soil and vegetation types is shown in a key.

79. **Surface application of binding materials for controlling soil erosion (1948–1957).** *Bibliogr. Bur. Soils, Harpenden* No. 110, 1957. pp. 9. Limited distribution.

Annotated list of 35 references.

80. RAEDER-ROITZSCH, J. E. **The use of asphalt emulsion to control roadside erosion.** *Main Roads, Sydney* 23 (1), 1957 (24–8). D.S.I.R.

Describes experiments in the stabilization of cut slopes and embankments in the Snowy Mountains, New South Wales. Grass and clover were sown in combination with a spray of asphalt either direct on the seedbed or on a thin mulch of straw kept in place by the spray. Mulching proved necessary on difficult (e.g. on dry or very steep) sites. Generally a rate of 0·5 gal./sq. yd. of a 50/50 asphalt/water emulsion sufficed to hold the mulch (ca. 2 tons/acre) in place for one growing season. *From author's summary.*

14. Systematic Zoology

145.7. Insecta. Entomology

See also Nos. 749 *et seq.*, 1168 *et seq.*

81. HARRIS, W. V. **An introduction to Malayan termites.** *Malay. Forester* 21 (2), 1958 (87–97 + 2 photos). 5 refs.

Includes a field key.

82. MERKER, E., and EICHHORN, O. Die Formenkreise der gefährlichen Tannenläuse Gattung *Dreyfusia* (*Adelges*). **[Grouping in the genus *Adelges*.]** *Naturwissenschaften* 43 (19), 1956 (453–4). 10 refs. [G.] O.R.S.

Counts of pores on the spinal plates showed the following groupings: (1) *A. piceae typica*, Canadian *A. piceae* from Balsam Fir, *A. prelli*, and *A. piceae* Freiburg form. (2) *A. nüsslini* f. *typica* and f. *schneideri*.

83. MERKER, E. Chromatographische Artbestimmung von Tannenläusen der Gattung *Dreyfusia*. **[Determination of species of the genus *Adelges* by chromatography.]** *Naturwissenschaften* 45 (5), 1958 (118–9). 10 refs. [G.] O.R.S.

Paper-chromatographical experiments show quite different patterns for *A. piceae*, *A. nüsslini*, and *A. merkeri* (all from *Abies alba*), *A. prelli* (from *Abies nordmanniana*) and '*A. piceae*' (from *Abies grandis* in the U.S.A.). It is concluded that these are 5 distinct species, and that the American species is not, as is generally believed, the ordinary European species introduced with transplants from Europe.

84. ***Lepidosaphes* ulmi (L.). (Homopt., Coccoidea) (Oystershell scale).** *Distr. Maps Insect Pests (Ser. A.)* No. 85, 1958. pp. [2].

85. BALACHOWSKY, A. S. Les cochenilles de la Guadeloupe et de la Martinique. (Première liste).

[The Coccoidea of Guadeloupe and Martinique. (Preliminary list).] *Rev. Path. vég.* 36 (4), 1957 (198–208). 11 refs. [F.] I.M.I.

A preliminary annotated list of 38 species. Among hosts are the Mango, Mahogany [?*Swietenia* sp.] and *Bambusa*.

86. EMBREE, D. G. **The external morphology of the immature stages of the Beech leaf tier, *Psilocorsis faginella* (Chamb.) (Lepidoptera: Oecophoridae), with notes on its biology in Nova Scotia.** *Repr.* from *Canad. Ent.* 90 (3), 1958 (166–74). 12 refs.

87. FÉRON, M. Le comportement de ponte de *Ceratitis capitata* Wied: influence de la lumière. **[Mode of oviposition of the Mediterranean fruit fly: influence of light.]** *Rev. Path. vég.* 36 (3), 1957 (127–43). 11 refs. [F.] I.M.I.

Intensities of 2500 luxes excited 50% more oviposition than 50. Zones of 30–50 luxes were preferred to those of 2500 for actual punctures. Independently of light, the lower part of the fruit is preferred. The mean of 4 eggs/puncture confirmed other observations.

15. Animal Ecology. Game and Fish Management. Hunting, Shooting and Fishing

See also Nos. 11, 745–8, 896.

88. PALMAR, C. E. **Woodpeckers in woodlands.** *Leafl. For. Comm., Lond.* No. 42, 1958. pp. 11. Price 1*s*.

Describes the appearance, behaviour, habits etc. of the 3 British species—*Picus viridis*, *Dendrocopus major* and *D. minor*—with a brief discussion of possible benefits or damage from the forester's point of view.

89. CAMPBELL, B. **The crested tit [*Parus cristatus*].** *Leafl. For. Comm., Lond.* No. 41, 1958. pp. 12. 23 refs. Price 1*s*.

90. HAGEN, Y. Orientering om påbegynte undersøkelser over vinternæringen hos elg og rådyr i Norge. **[Preliminary report on investigations on winter feeding of elk and roe deer in Norway [: an unpublished report, summarized by K. Bjor].]** *Norsk Skogbr.* 4 (15), 1958 (435–6). [Nor.]

A study of the number of branchlets browsed by roe deer in Feb.-March 1956 and Jan.-March 1957 in Vestby showed that *Vaccinium myrtillus* was the chief food plant, with *Calluna vulgaris* second. Snow cover was light. Browsing was confined to heights below 1·1–1·2 m. above ground surface. Spruce, Pine and Birch were rarely touched. A study on browsing by elk in Vestby and two Østland districts, Hurdal and Åmot-Trysil, in the early months of 1957 and 1958, showed a preference for Pine in Hurdal, where there were fewer hardwood trees available, and for Willows in the other two districts. *V. myrtillus* was heavily browsed in Åmot-Trysil where the snow cover was light. Spruce was rarely browsed in any district. Top browsing was rare but heavier for Pine than Spruce in Åmot-Trysil. A calculation of weights of fodder eaten in Vestby showed that Pine was most browsed, followed by Juniper, Willows, etc. A calculation in Karder, Vestby, showed that one elk ate 948 branchlets or 1·6 kg. per day. Results are compared with some from Finland. [See *F.A.* 18 No. 1270.]

91. STOECKELER, J. H., KEENER, J. M., and STROTHMANN, R. O. **Deer browse production from felled trees in the northern hardwood-Hemlock forest type.** *J. For.* 56 (6), 1958 (416–21). 4 refs.

Trees were felled in the winter in N.E. Wisconsin and the tops lopped to provide supplemental browse for deer. Sugar Maple, Red Maple, Yellow Birch, Basswood, and White Ash in pole and sawlog stands yielded ca. 13 lb. and Hemlock 117 lb. of fresh browse per sq. ft. of b.a. Hardwoods in the 1–5 in. diam. class gave 26·3–46·2 lb./sq. ft. The time and cost aspect of the work is examined.

16. General Botany

160. Plant Chemistry

See also Nos. 99, 102, 114–8, 123–6, 147, 188, 241, 243, 245–6, 361, 650, 655, 998 *et seq.*, 1242 *et seq.*

92. ROACH, W. A. **A machine for disintegrating living woody shoots.** *Ann. Bot., Lond.* 22 (86), 1958 (291–2 + 2 photos). 1 ref. O.R.E.

The machine, developed for research purposes at East Malling Research Station from a standard fast-rotating, circular, tempered-steel wire brush, reduces twigs to a fine powder and allows the extraction of constituents as nearly as possible in the condition in which they exist in the living tissue.

93. HES, J. W. **Leaffall and excretion.** *Acta bot. neerland.* 7 (2), 1958 (278–81). 3 refs. [E.] O.B.D.

Leaves dropped at the end of the season from *Kigelia aethiopica* were collected, dried and analysed. The results are presented and compared with those of analyses of younger leaves. Older leaves show a higher % of ash; are poorer in N, K_2O and P_2O_5 and richer in Si, Fe and Al_2O_3, i.e. they are poorer in material that is physiologically more mobile. Analyses of leaves of *Mangifera indica*, *Cassia fistula* and sugar-cane also show that the ash % of older leaves and the N, K_2O, P_2O_5 and Si contents are higher than in younger leaves.

94. BUCH, M. L. **Bibliography of organic acids in higher plants.** U.S. Department of Agriculture, Washington. No. *ARS*-73-18, 1957. pp. 136. 850 refs.

For each of the organic acids (arranged in alphabetical order), gives species and part of plant in which it occurs (arranged systematically), with references to the list of literature citations.

95. WHITE, D. E. **Chemistry of plant products.** *Nature, Lond.* 182 (4631), 1958 (299–300).

Gives some account of a symposium held in March 1958 at the University of W. Australia, including papers on: fractionation of *Xanthorrhoea* resins (*R. H. Pearce*); chemical aspects of sapwood-heartwood transformation with particular reference to the increased polyphenolic content of the heartwoods of Australian timber trees (*W. E. Hillis*); the primary tars obtained by the distillation of

Jarrah and Karri sawdust (*D. E. White*); the constitution of globulol in W. Australian Myrtaceae (*G. J. H. Melrose* et al.); and triterpenoid constituents of the Myrtaceae (*J. O. Knight* et al.).

96. GOODWIN, T. W. **Studies in carotenogenesis. 24. The changes in carotenoid and chlorophyll pigments in the leaves of deciduous trees during autumn necrosis.** *Biochem. J.* 68 (3), 1958 (503–11). 31 refs. O.R.S.

Chlorophyll and carotenoid content and, for *Prunus nigra*, the anthocyanin content, were determined for leaves collected in June–Nov. 1956 from one tree each of *P. nigra*, *Quercus robur* and *Acer pseudoplatanus*. In both Oak and Sycamore the chlorophyll and carotenoid contents dropped almost to zero before the end of the period, in Oak falling simultaneously, in Sycamore the chlorophyll falling first. In the Plum, carotenoids tended to disappear first, but levels of both carotenoids and chlorophyll fell only to ca. 50%. There was no loss of anthocyanin in the Plum leaves.

97. GRIFFITHS, L. A. **Occurrence of gentisic acid in plant tissues.** *Nature, Lond.* 182 (4637), 1958 (733–4). 8 refs.

In the course of chromatographic studies on the phenolic constituents of *Theobroma cacao*, an ultraviolet-fluorescent compound was shown to be widely distributed throughout the tissues of the plant and this has been identified with gentisic acid (2:5-dihydroxybenzoic acid). Representative species of 80 families of angiosperms have now been examined by a chromatographic technique and positive identifications of gentisic acid obtained in 73 families. It was of more frequent occurrence and tended to be present in larger amounts in woody species than in herbaceous or monocotyledonous ones, and it is therefore believed that gentisic acid may be concerned in lignification. The content of bound gentisic acid in the surface tissues of the plant may also be a factor in the plant's resistance to fungal attack [cf. *F.A.* 13 No. 60].

98. BODE, H. R. Beiträge zur Kenntnis allelopathischer Erscheinungen bei einigen Juglandaceen. **[Allelopathy in some Juglandaceae.]** *Planta* 51 (4), 1958 (440–80). 27 refs. [G.g.] O.B.D.

Reports on a study of the effects of leaf extracts of *Juglans* spp. on the growth of tomato [cf. *F.A.* 18 No. 1272].

161. Physiology

See also Nos. 34, 130, 141, 149, 225, 235 *et seq.*, 441, 682, 949, 951–2, 978–9, 1265.

99. **Annual review of plant physiology. No. 9.** Annual Reviews Inc., Palo Alto, Calif. 1958. pp. 510. Many refs.

Includes the following review articles, containing many references to forest tree species: The quantum yield of photosynthesis (*R. Emerson*); Physiology of salt tolerance (*L. Bernstein* and *H. E. Hayward*); The naturally-occurring auxins and inhibitors (*J. A. Bentley*); Destruction of auxin (*P. M. Ray*); Metabolism of ascorbic acid in plants: Part I. Function (*L. W. Mapson*); Physiology of the tobacco plant (*R. A. Steinberg* and *T. C. Tso*); Mineral nutrition of tree crops (*W. Reuther, T. W. Embleton* and *W. W. Jones*) [deals almost entirely with fruit trees: 250 refs.]; Physiology of the fresh-water algae (*R. W. Krauss*); The metabolism of amino acids and proteins in plants (*E. W. Yemm* and *B. F. Folkes*); Auxin uses in the control of flowering and fruiting (*A. C. Leopold*); Herbicides (*F. K. Woodford, K. Holly*, and *C. C. McCready*); Morphogenesis in lower plants (*L. F. Jaffe*); Post-harvest physiology of fruits (*R. Ulrich*); The biogenesis of flavonoids (*L. Bogorad*); Cytochromes in plants (*L. Smith* and *B. Chance*).

100. **Bibliography on effect of radiation and radioactive products on plants and plant growth. Uptake of fission products by plants from soil. (1912–1958).** *Bibliogr. Bur. Soils, Harpenden* No. 114, 1958. pp. 21. Limited distribution.

[Cf. *F.A.* 20 Nos. 16–7.] Annotated bibliography of 106 references.

101. VETERENNIKOV, A. V. Primenenie potometra dlja opredelenija aktivnoj poverhnosti kornevyh okončanij sosny. **[A potometer for determining the active surface of root-tips of *Pinus sylvestris*.]** *Fiziol. Rast.* 4 (6), 1957 (566–9). 7 refs. [Russ.e.] A.P.B.

Describes and illustrates a potometer consisting of a graduated glass capillary inserted into a rubber tube with a glass rod at the other end of the tube for adjusting the meniscus. Two diametrically opposite holes, comparable in size to the diameter of the root, are made (with a hot needle) in the rubber tube and are connected on one side by a slit, to permit insertion of the root. The potometer is filled with water and the root is passed through the holes so that the part to be studied lies within the tube. Any gaps between the root and the hole are stopped with cocoa butter, and the root tip is covered with damp moss for the duration of the experiment. To give the tube added stability it is advisable to glue it to a support. Using this method, the water uptake of *Pinus sylvestris* root tips was shown to be closely related to the degree of suberization of the peripheral tissues.

102. ZIMMERMANN, M. H. **Translocation of organic substances in trees. I. The nature of the sugars in the sieve tube exudate of trees. II. On the translocation mechanism in the phloem of White Ash (*Fraxinus americana*). III. The removal of sugars from the sieve tubes in the White Ash (*Fraxinus americana* L.).** *Plant Physiol.* 32 (4; 5), 1957 (288–91; 399–44); 33 (1), 1958 (213–7). 82 refs. O.R.E.

Part I presents an analysis of the exudates of 16 species of 11 families. Only non-reducing oligosaccharides of the raffinose family were found. Sucrose was the main transport sugar, but in some species most (as in *Fagus grandifolia*), or part (as in *Ulmus americana* and *Tilia americana*), were in the form of raffinose and stachyose. Part II describes experiments to test Münch's theory of mass flow, which the following results appear to support: (*a*) a gradual decrease of concentration of the exudate after tapping, suggesting osmotic dilution with water from surrounding tissue; (*b*) a retention

of turgor in the tubes for 1 or 2 days after total leaf-fall, and an absence of correlation between molecular size and turgor gradient, suggesting that there is no 'leak' from the tubes; (*c*) a mass flow occurring ca. ½ hour after tapping, and the sieve tubes immediately above a cut being tappable a second time following the first cut; (*d*) total molar-concentration gradients being positive in the downward direction throughout the summer, though they differ for different substances. After leaf abscission, a gradient inversion takes place for some substances and the total gradient disappears. In Part III, the sieve-tube sugars are analysed after artificial defoliation and during and after autumnal leaf-fall. After defoliation, the tubes remained turgid for an unlimited time. New leaves began to appear after ca. 2 weeks. In autumn, tapping was possible for 2–3 weeks after the abscission layers had been formed. Two metabolic mechanisms that may remove sugar from the tubes are described. From the breakdown rate of stachyose immediately after, and the measured stachyose along the stem before, defoliation, the rate of translocation was calculated at 62, 73, and 54 cm./hour respectively for the 3 experiments made. *From author's summaries.*

103. CAILLOUX, M. Une théorie sur le méchanisme de la coulée printanière de sève chez l'*Acer saccharum*. [**A theory of the mechanism of spring sap flow in *A. saccharum*.**] *Proc. 8th. int. bot. Congr. 1954 Sect. 11–12*, 1957 (214–6). [F.]

In wood samples taken from living trees during the spring sap-flow, starch in the medullary rays and wood parenchyma disappeared at temperatures $< 10°$ C. and reappeared in abundance at temperatures above this point. Conversion of starch to sucrose and the reverse can take place in < 60 min. A theory of the mechanism of sap flow based on these facts is presented.

104. GREENE, M. T., and MARVIN, J. W. **The water content of Maple stems. I. Application of the Karl Fischer method for the analysis of water in Maple bark and wood. II. Apparent changes in the water content of Maple stems and the physiology of Maple sap flow.** *Plant Physiol.* 33 (3), 1958 (169–76). 21 refs. O.R.E.

Determinations of water content (in % of dry weight) of samples from a dormant stem of *Acer saccharum* ca. 2–3 cm. in diam. and 60 cm. high, by this titration method (described), yielded values comparable with oven-drying when the samples were taken at room temperatures but lower values if samples were taken in the frozen state. With a rise of temperature from $-5°$ to $+25°$ C, the content of alcohol-extractable (free) water decreased consistently for wood of 11 stems tested, while the values for bark were inconsistent. The physiological implications of the phenomenon, which greatly exceeded in magnitude the loss of sap on thawing, are discussed. It is thought to be related to sap flow, but not an essential mechanism. The phenomenon was also observed with *A. pennsylvanicum*, *Juglans cinerea* and *Betula lutea* (all sap-yielding species) but not with *Fraxinus americana* and *Quercus borealis*.

105. MØLLER, C. M. Negative grene? ['**Negative' branches?**] *Dansk Skovforen. Tidsskr.* 43 (7), 1958 (372–8). [Dan.]

Summarizes Bavngaard's most recent contribution [see *F.A.* 19 No. 2825], and restates objections to the theories he advanced in 1946 [see *F.A.* 8 Nos. 1481, 2156], adding summaries of other more recent articles by other authors [see *F.A.* 13 Nos. 158, 3697].

106. REES, A. R. **Field observations of midday closure of stomata in the Oil Palm, *Elaeis guineensis* Jacq.** *Nature, Lond.* 182 (4637), 1958 (735–6). 4 refs.

In the course of studies on stomatal movement of Oil Palms under field conditions, some effects of soil moisture on midday closure have been observed [cf. *F.A.* 18 No. 2487]. To obtain further information on the effect of rain, a comparison was made, during the severe dry season of 1958, of the extent of midday closure in two Palms, one of which (*a*) was amply watered. After 33 days the second Palm (*b*) was also watered to show any differences not due to treatment. There was a significant difference in the extent of midday closure in the two Palms, which disappeared when (*b*) was watered. The significant difference in air temperature under the two Palms also disappeared after watering. A difference of 3° C. between the air-temperature/leaf-temperature relationship for the two treatments would account for the observed differences between watered and unwatered plants. A significant reduction in the temperature of fully exposed leaflets due to watering was demonstrated. The observed lag between watering and the resulting drop in air temperature indicates that the latter is not due to evaporation at soil level. There appears to be some justification for regarding midday closure of stomata as a sensitive indication of water stress.

107. KLEŠNIN, A. F., and ŠUL'GIN, I. A. Ob intensivnosti transpiracii pri iskusstvennom osveščenii. [**The rate of transpiration in artificial light.**] *Fiziol. Rast.* 4 (6), 1957 (548–53). 3 refs. [Russ.e.] A.P.B.

Gives the results of studies made under three different light intensities on 18 species of plants representing different ecological types, including some tree species (*Salix* sp., *Pyrus malus*, *Acer* spp., and *Populus tremula*).

108. IVANOV, L. A. Transpiracionnoe soprotivlenie i vlijanie na nego vysokih i nizkih temperatur. ['**Transpiration resistance' and the influence of high and low temperatures on it.**] *Fiziol. Rast.* 4 (5), 1957 (409–16). 11 refs. [Russ.e.] A.P.B.

The transpiration rate is almost always less than the rate of evaporation from a free water surface under identical environmental conditions; this phenomenon, which involves any factors (morphological, anatomical, physiological) that impede transpiration, is termed 'transpiration resistance'. Transpiration measurements on Pear, Oak and Elm in the Derkul steppe showed that during a hot drying wind with an air temperature of 30–45° C., transpiration decreased significantly as compared with cooler times of day. To determine whether

transpiration resistance was of widespread occurrence, field experiments were made on 15 tree species in 3 climatic zones: steppe, forest-steppe and forest (near Moscow). Shoots on the trees were artificially heated to 35–42° for 10 minutes, allowed to cool to air temperature, and then removed for transpiration measurements by Ivanov's rapid weighing method. Data are tabulated to show the increase of transpiration resistance in treated shoots of each species (difference in the amounts transpired by heated and control shoots, expressed as a % of the latter). A drop in transpiration (sometimes by as much as 60%) occurred in all species regardless of location and sometimes lasted 10 hours. There was evidence of variation in the effect with time of day, season, and age of foliage. Laboratory tests were also made on evaporation from ground-up Birch leaves compared with that from the surface of distilled water; there were 3 variants: (*a*) leaves heated at 38° for 10 min., cooled to air temperature, and then ground up; (*b*) leaves ground up, the pulp heated and then cooled to air temperature; (*c*) leaves pulped but left unheated. Evaporation was reduced in both (*a*) and (*b*), in both cases the reduction averaged 27% of the evaporation from water. Values for (*c*) were also less than those for the water, but the reduction was smaller. In all cases the reduction in evaporation was greatest at mid-day. Increased resistance to transpiration is also found in Pine when temperatures are below 0° C. during the hardening-off period in late autumn and also at the end of winter.

109. KOZLOWSKI, T. T., and GENTILE, A. C. **Respiration of White Pine buds in relation to oxygen availability and moisture content.** *For. Sci.* 4 (2), 1958 (147–52). 7 refs.

[Cf. *F.A.* 14 No. 3035.] Uptake of O and fresh and dry weight of intact buds were low until bud-break, when they increased rapidly. The uptake of O in buds with scales removed was significantly greater than that in intact buds, but this difference decreased rapidly after bud-break. The uptake of O appears to be limited by the difficulty of access to the internal bud tissues and by the moisture content of respiring cells, the relative share of each of these factors not being determined in this experiment.

110. PISEK, A., and WINKLER, E. Assimilationsvermögen und Respiration der Fichte (*Picea excelsa* Link) in verschiedener Höhenlage und der Zirbe (*Pinus cembra* L.) an der alpinen Waldgrenze. **[Assimilation capacity and respiration of *P. abies* at various altitudes and of *P. cembra* at the alpine forest limit.]** *Planta* 51 (4), 1958 (518–43). 20 refs. [G.g.] O.B.D.

From the time that the current year's needles are mature, the assimilating capacity (mg. CO_2/g. dry weight/hr. at 12° C., 10,000 luxes) of the conifers studied remains highly constant throughout the summer until far into the autumn, so long as there is no frost. When temperatures begin to fluctuate round freezing point, assimilation capacity fluctuates with temperature. The needles cease to fix C in excess when the temperature sinks a few degrees below zero (− 4 to − 5° C.). Repeated night frosts not only inhibit photosynthesis throughout their duration, but also reduce it more and more during the day, when the temperature rises above 0°. Temperatures of − 6 to − 8° cause assimilation capacity to sink to nil and below. It only rises again with a lengthy period of mild winter weather, and to normal, only in spring. Thus evergreen north-alpine conifers can only profit from the retention of their foliage for assimilation purposes so long as no long or severe frosts occur. At the forest limit photosynthesis may be kept so low for 4–5 months, that, at best, a CO_2 balance is just maintained. During this time, the C balance of the plant as a whole remains negative. Night respiration (Spruce) in both summer and winter is greater at the forest limit than at lower levels. The fact that both species at all altitudes in midwinter (particularly at temperatures round 0°) have a markedly lower respiration rate than at the same temperatures in summer, is additional evidence that the trees at this time reach a certain stage of dormancy. [Cf. *F.A.* 20 Nos. 236–7.]

111. PISEK, A., and REHNER, G. Temperaturminima der Netto-Assimilation von mediterranen und nordisch-alpinen Immergrünen. **[Minimum temperatures of net assimilation in Mediterranean and northern alpine evergreens.]** *Ber. dtsch. bot. Ges.* 71 (4), 1958 (188–93). 14 refs. [G.] O.B.D.

Fifteen evergreen species were tested in the laboratory at 3300 luxes to find for each the temperature of the compensation point.

112. KUSOMOTO, T. **Physiological and ecological studies on the plant production in plant communities. 3. Ecological considerations of the temperature-photosynthesis curves of evergreen broad-leaved trees.** *Japanese Journal of Ecology* 7 (3), 1957 (126–30). [Jap.e.] From *abstr.* in *Biol. Abstr.* 32 (6), 1958 (No. 18613).

The temperature/photosynthesis curves of *Shiia sieboldii*, *Machilus thunbergii*, *Distylium racemosum*, *Rapania neriifolia*, *Illicium religiosum*, *Quercus glauca*, *Myrica rubra*, *Lithocarpus edulis*, *Symplocos lucida*, *Camellia japonica*, *Eurya japonica*, and *Cinnamomum camphora* were measured for an ecological study of evergreen broadleaved forest on the basis of woody-matter production. Production of *C. japonica*, *I. religiosum*, *S. sieboldii*, *M. rubra*, and *E. japonica* fell in winter, and that of *S. lucida*, *S. sieboldii*, and *Q. glauca* was very high during high summer temperatures. Other species, notably *M. thunbergii*, *D. racemosum*, and *L. edulis* had high production in spring and autumn.

113. PEARSON, L. C., and LAWRENCE, D. B. **Photosynthesis in Aspen bark.** *Amer. J. Bot.* 45 (5), 1958 (383–7). 7 refs. O.B.D.

By use of the spectrophotometer, the green pigments in *Populus tremuloides* bark were shown to be chlorophyll; these pigments were also found to be more abundant in bark than in leaves of Aspen per unit area during the early part of the growth season, but more abundant in leaves later in the summer. By use of the starch-iodine test, it was ascertained that the chlorophyll in Aspen bark is photosynthetically active. It is suggested that this ability of Aspen to carry on photosynthesis in its bark might partly

account for the ability of this species to thrive in what is otherwise mainly an evergreen conifer environment. *Authors' summary.*

114. BARLOW, G. B., and PATRICK, A. D. **Uptake and utilization of DL-[2-^{14}C] mevalonic acid by *Hevea brasiliensis*.** *Nature, Lond.* 182 (4636), 1958 (662–3). 7 refs.

It is concluded that under the conditions of this experiment on 2-year-old greenhouse plants, mevalonic acid was not incorporated into rubber in *H. brasiliensis*, and that it was converted in the stem to products unable to enter the pathway of carotene synthesis, which can operate with high efficiency in the leaves.

115. STANLEY, R. G. **Terpene formation in Pine from mevalonic acid.** *Nature, Lond.* 182 (4637), 1958 (738–9). 6 refs.

Although the incorporation of atmospheric CO_2 into Pine terpenes has been demonstrated, studies on the nature of the pathway by which these compounds originate have not been reported. In the present study, seedlings of *Pinus attenuata* were found to incorporate acetate-2-C^{14} and mevalonic acid-2-C^{14} into the monoterpenes. The turpentine of this Pine is 98% α-pinene.

116. **Bibliography on toxicity of root excretions (1936–57).** *Bibliogr. Bur. Soils, Harpenden* No. 128, 1958. pp. 6. Limited distribution.

Annotated list of 30 references.

117. STANLEY, R. G. **Glucose metabolism in germinating Pine pollen (*Pinus ponderosa*).** *Abstr.* in *Plant Physiol.* 32 (Suppl.), 1957 (xlvi). O.R.E.

A study employing antibiotics to germinate Ponderosa Pine pollen in solutions buffered at pH 6, and following, with the help of radio-active carbon, the changes in the pathways of glucose metabolism.

118. MICHALSKI, L. Próba chromatograficznej i biologicznej analizy regulatorów wzrostu w ekstraktach z pyłku leszczyny (*Corylus avellana* L.). [**A chromatographic and biological analysis of growth substances in extracts from pollen of *C. avellana*.**] *Acta Soc. Bot. Polon.* 27 (1), 1958 (75–82). 17 refs. [Pol.pol.g.] O.B.D.

119. WITTWER, S. H., and BUKOVAC, M. J. **The effects of gibberellin on economic crops.** *Econ. Bot.* 12 (3), 1958 (213–55). 204 refs.

A detailed review with quotation of authorities to 1958, mainly on forage, horticultural, and agricultural plants but covering some of woody growth.

120. LOCKHART, J. A., and BONNER, J. **Effects of gibberellic acid on the photoperiod-controlled growth of woody plants.** *Plant Physiol.* 32 (5), 1957 (492–4). 10 refs. O.R.E.

Dormant, 2-year-old pot plants of *Camellia japonica*, *Pinus coulteri* and *Pseudotsuga macrocarpa*, i.e. species requiring long days, but not periods of low temperature, for the resumption of growth, were subjected to various photoperiodic and night-temperature regimes; one half of each group had gibberellic acid applied to the terminal bud first at weekly and then at shorter intervals. Dormancy in Camellia could be effectively broken in plants under short-day, and resumption of growth accelerated in those under long-day treatment by the application of gibberellic acid which, however, did not affect the behaviour of the conifers. Within 6–8 weeks of exposure to long days, all plants resumed growth, but of those held under a short-day regime, only 10–20% showed signs of breaking dormancy after 4 months, both in the treated and the untreated groups.

121. BOURDEAU, P. F. **Interaction of gibberellic acid and photoperiod on the vegetative growth of *Pinus elliottii*.** *Nature, Lond.* 182 (4628), 1958 (118). 4 refs.

Conifers have not proved very responsive to treatment with gibberellic acid (GA) [cf. *F.A.* 18 No. 1293; 19 Nos. 378, 2705], but its effects on stem growth have generally been tested under natural photoperiods or under long days. The results presented in this study indicate that GA promotes the growth of *Pinus elliottii* only under short-day conditions. It seems that, in this species, GA is able to break the type of bud dormancy induced by short-day treatment, and to stimulate the growth of elongating shoots exposed to short photoperiods. The lack of response to the GA in the long-day treatments suggests that the natural gibberellin factor becomes deficient, in this species, only under short days. In contrast to *P. elliottii*, two other conifers (*P. coulteri* and *Pseudotsuga macrocarpa*) did not respond to GA under short days [see preceding abstract]. Interactions between GA and photoperiod have also appeared in a preliminary study on bud-break in deciduous species. In some of these, e.g. *Acer platanoides*, GA hastened bud opening to a greater extent under short than under long days.

122. WAREING, P. F. **Interaction between indole-acetic acid and gibberellic acid in cambial activity.** *Nature, Lond.* 181 (4625), 1958 (1744–5). 2 refs.

Experiments were carried out with one-year pot-grown *Acer pseudoplatanus*, and isolated shoots of *Populus nigra* var. *italica* and *Fraxinus excelsior* gathered before the buds swelled. All material was disbudded and treated (*a*) with indole-acetic acid (IAA), (*b*) with gibberellic acid (GA), (*c*) with IAA + GA, and (*d*) with plain lanolin as a control. Treatment (*a*) results in the formation of a narrow zone of new xylem with lignified vessels; (*d*) produced no new wood; (*b*) produced a zone of new tissue consisting of small unlignified cells and no sign of vessels; (*c*) produced a wide zone of new wood consisting of fully lignified vessels with intervening fibrous tissue and approximating closely in structure to that of normal wood. It seems that normal xylem development involves the interaction of both endogenous indole-acetic acid and some native gibberellin.

123. STANLEY, R. G. **Krebs cycle activity of mitochondria from endosperm of Sugar Pine seed (*Pinus lambertiana* Dougl.).** *Plant Physiol.* 32 (5), 1957 (409–12). 17 refs. O.R.E.

Mitochondria isolated from the haploid endosperm (♀ gametophyte), mostly from ungerminated seed, were found to contain the enzymes of the

Krebs cycle. Water absorption increased the activity of the Krebs cycle system. *From author's summary.*

124. STANLEY, R. G., and CONN, E. E. **Enzyme activity of mitochondria from germinating seedlings of Sugar Pine (*Pinus lambertiana* Dougl.).** *Plant Physiol.* 32 (5), 1957 (412–8). 29 refs. O.R.E.

Describes experiments indicating that the mitochondria of *P. lambertiana*, the first gymnosperm species investigated, are similar to those of other plants and animals in their capacity to catalyse the oxidation of acids of the Krebs cycle, including the presence of mechanisms for the oxidation of fatty acids. The mitochondria from embryos of ungerminated seed showed a higher oxidative activity on various Krebs-cycle substrates than particles from 5-day-old germinated seedlings or from embryos of seeds stratified for 60 or 120 days. Such mitochondria could, however, be stimulated by the supernatant from ungerminated seeds from which the mitochondria were removed. *From authors' summary.*

125. GILBERT, S. G., and SELL, H. M. **Biochemical changes during germination of the Tung seed.** *Plant Physiol.* 32 (6), 1957 (668–74). 8 refs. O.R.E.

Changes in chemical composition, respiratory gas exchange and enzymatic activities were investigated in dry-stored and stratified seeds. The faster germination of the latter was associated with the activation of enzymes, lipase and amylase through water absorption, which resulted in a more efficient utilization of oil reserves. One end-product of oil utilization was starch. *From authors' summary.*

126. RÄDER-ROITZSCH, J. E. Untersuchungen über die Stoffwanderung im Keimungsverlauf von *Quercus pedunculata* Ehrh. **[Investigations on the movement of nutrients during the germination of *Q. robur*.]** *Forstwiss. Cbl.* 77 (3/4), 1958 (109–24). 13 refs. [G.]

A detailed study, tracing the changes and movements of the important groups of nutrients during the germination of acorns. Changes in fresh weight, moisture content, dry weight, carbohydrate content, crude fibre content, ether-soluble substances, compounds containing N, and mineral content of the acorns, are shown graphically.

127. WAREING, P. F., and NASR, T. **Gravimorphism in trees: effects of gravity on growth, apical dominance and flowering in fruit trees.** *Nature, Lond.* 182 (4632), 1958 (379–80). 8 refs.

Detailed studies were begun in 1956, using 'maiden' trees of Apple, Cherry, Plum, and Blackcurrant planted in pots and restricted to a single shoot in the second year. The growth of trees kept in a horizontal position (*a*) throughout the growing season was compared with that of vertical controls (*b*). In all species the total growth of (*a*) trees was markedly less than that of (*b*), and this effect was accentuated in horizontal trees that were rotated through 180° twice a day. Growth of all shoots was less in (*a*) than in (*b*) but the % reduction in growth was greatest in the uppermost shoots of (*a*), while the greater growth of the uppermost shoots in (*b*) results in well marked apical dominance. Thus it appears that the apical dominance exhibited by the uppermost shoot is only manifested when it occupies a vertical position. Treatments were continued for a second year with Apple layers, and while (*b*) plants initiated relatively few flowers, (*a*) plants, both 'rotated' and 'non-rotated', showed heavy flowering on both 2nd-year and 1st-year shoots. These effects of gravity on growth and flowering are clearly related to geotropism, but since this term is used to describe a growth curvature, it is not strictly appropriate to the phenomena reported here, for which the term gravimorphism is proposed.

128. LONGMAN, K. A., and WAREING, P. F. **Gravimorphism in trees: effect of gravity on flowering and shoot growth in Japanese Larch (*Larix leptolepis*, Murray).** *Nature, Lond.* 182 (4632), 1958 (380–1). 2 refs.

[Cf. *F.A* 20 No. 263.] An experiment was carried out in which branches were trained into (*a*) horizontal and (*b*) downwardly directed positions, an equivalent branch in each whorl being left in its natural upwardly curving position (*c*), and in some cases a further branch (*d*) was fixed in its existing position to prevent any tendency to sag during the experiment. These treatments were applied during April 1957 to 2- to 5-year-old branches on trees 10–12 years old that had not yet borne an appreciable number of flowers. By autumn 1957 the flower buds for 1958 were clearly visible, and it was found that out of 12 treated trees, 10 showed more flowering in (*a*) and (*b*) than in (*c*) and (*d*)—average number of flower buds per branch being (*a*) 50, (*b*) 90, (*c*) 5·5, and (*d*) 2. (The remaining two trees did not flower at all, possibly because they were smaller than average.) The flowering of young Japanese Larch is thus markedly influenced by the position of the branches in relation to the gravitational field, the greater the branch angle, measured from vertically upwards, the heavier the flowering. It seems probable that this 'gravimorphic' effect is important also in the normal reproductive development of Larch. Treatments (*a*) and (*b*) also markedly reduced extension growth of shoots, which was respectively 59·5% and 47·5% of (*c*). Gravity also appears to affect the distribution of flower buds on individual Larch twigs; 98% of all buds point either downwards or horizontally.

162. Pathology. Teratology

See also No. 156.

129. LOONEY, W. S., and DUFFIELD, J. W. **Proliferated cones of Douglas-Fir.** *For. Sci.* 4 (2), 1958 (154–5). 1 ref.

An illustrated description of cones from a 20-year *Pseudotsuga taxifolia* in the Wynooch Valley, Grays Harbour County, Wash., which bore only this sort, with no fertile seed. The tree will be propagated for further study.

163. Embryology

130. CAMEFORT, H. Rôle du suc nucléaire et des nucléoles dans la formation du cytoplasme du

proembryon chez le *Pinus laricio* (var. *austriaca*). **[The role of the nuclear sap and the nucleoli in the formation of the cytoplasm of the proembryo in *P. nigra* var. *austriaca*.]** *C.R. Acad. Sci., Paris* 246 (13), 1958 (2014–7). 1 ref. [F.f.] O.R.S.

131. POLUNINA, N. N. Sravnitel'noe izučenie embriologii i biologii cvetenija nekotoryh vidov evkalipta. **[A comparative study of the embryology and biology of flowering of some Eucalypt species.]** *Dokl. Akad. Nauk SSSR* 115 (4), 1957 (819–21). 6 refs. [Russ.] A.P.B.

Material was collected on the Black Sea coast from 8 species: *Eucalyptus macarthuri*, *E. deanei*, *E. cortada*, *E. cinerea*, *E. occidentalis*, *E. pauciflora*, *E. gigantea* and *E. stellulata*. As the structure and development of the reproductive organs was very similar for all species, the general description given is based on *E. cinerea*. The phenology of developmental stages of the flower is tabulated.

164. Morphology

See also Nos. 129, 139, 163, 180–1, 186, 188.

132. AL-TALIB, K. H. **The effect of defoliation of *Pseudotsuga taxifolia* on the transformation of bud scales into foliage.** *Abstr.* in *Plant Physiol.* 32 (Suppl.), 1957 (lii). O.R.E.

When the needles of a shoot were removed as soon as the bud had expanded, the newly developing buds for the next spring also expanded within 3 to 8 weeks, the primordia which would have become bud scales being transformed into needles. Removal of only the upper needles of the newly formed branch had the same effect, but not removal of the lower needles only. Application of 0·5% IAA in lanolin to the defoliated area prevented changes in the new buds.

133. AL-TALIB, K. H. **The aseptic culture of isolated buds of *Pseudotsuga taxifolia*.** *Abstr.* in *Plant Physiol.* 32 (Suppl.), 1957 (li). O.R.E.

Naked, sterilized, dormant buds, collected between October and February, were grown on a medium containing the usual macro- and micro-elements, glycine, thiamine, niacine, pyridoxine and sucrose, to which a number of substances, including gibberellic acid, coconut milk, urea etc., were added separately at various concentrations.

134. MILLER, E. E., SHADBOLT, C. A., and HOLM, L. **Use of an optical planimeter for measuring leaf area.** *Plant Physiol.* 31 (6), 1956 (484–6). 2 refs. O.R.E.

Describes a refined optical instrument for the rapid determination of irregular areas with high accuracy and without the need for leaf colour and texture calibration.

135. POLSTER, H., and REICHENBACH, H. Bestimmung von Blattflächen *in situ* durch lineare Messungen. **[The determination of leaf areas *in situ* by linear measurements.]** *Biol. Zbl.* 77 (3), 1958 (265–77). 17 refs. [G.g.] E.M.B.

A formula, $\log F = \log L + \log B - \log Bf$, where F = area, L length, B breadth and Bf a coefficient or 'leaf factor', proposed originally for Gramineae, was tested for individual leaves of 6 Poplar clones and one tree of Birch; it proved insufficiently accurate. A formula for total leaf area was obtained, $\Sigma F = \Sigma(L \times B) \times sK$ where sK (the sum coefficient) $= \frac{\Sigma F}{(L \times B)}$, F in this case being obtained by planimetering. Values of sK appeared to be specific to individual Poplar clones and could be used for identification.

136. VISHNU-MITTRE. **Abnormal pollen grains in some Indian gymnosperms with remarks on the significance of the abnormalities.** *J. Indian bot. Soc.* 36 (4), 1957 (548–63 + 1 plate). 36 refs. O.B.D.

Reports on 4 species of *Pinus*, 2 of *Podocarpus*, *Abies spectabilis*, *Tsuga brunoniana*, *Araucaria bidwillii* and *Gnetum scandens*.

137. ČIGURJAEVA, A. A. Ob iskopaemyh anormal'nyh mikrosporah hvojnyh. **[Abnormal fossil microspores of conifers.]** *Dokl. Akad. Nauk SSSR* 120 (3), 1958 (641–3). 13 refs. [Russ.] A.P.B.

Describes, with illustrations, irregularities in the shape or numbers of air sacs in pollen of *Abies* spp. and *Pinus* spp., giving data on geological period and location in the U.S.S.R. The significance of these abnormalities is briefly discussed.

138. TOYAMA, S., and MOROMIZATO, S. **[Breeding of *Eucalyptus* trees. (Report I) Characteristics of *Eucalyptus* seed.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 103, 1957 (1–24 + 28 photos, 148 drawings). 14 refs. [Jap.jap.e.e.]

A detailed account with many illustrations of the general and diagnostic characters (external and internal) of the seed and of the seedling types of (1) *E. citriodora*, (2) *E. maculata*, (3) *E. gomphocephala*, (4) *E. globulus*, (5) *E. viminalis*, (6) *E. cinerea*, (7) *E. tereticornis*, (8) *E. rostrata*, (9) *E. saligna*, (10) *E. punctata*, (11) *E. corynocalyx*, (12) *E. resinifera*, (13) *E. coriacea* and (14) *E. robusta*. The sterile seeds of (1)–(9) are easily distinguished by both (*a*) form and (*b*) colour, and those of (10)–(12) by (*a*); but those of (13) and (14) are difficult to distinguish by either.

165.1. Phylogeny, Evolution

139. GULISAŠVILI, V. Z. Protivorečivye osobennosti v nasledstvennosti reliktovyh drevesnyh porod i ih značenie dlja razvitija rastitel'nyh organizmov. **[Contradictory characters in the heredity of relict tree species and their significance for the development of plant organisms.]** *Izv. Akad. Nauk SSSR (Ser. biol.)* 1958 (3), (271–81). 26 refs. [Russ.e.] A.P.B.

Discusses, from data in the literature and from personal observations, the flushing, flowering and growth of relict tree species in Transcaucasia, all appearing to show some characters not consistent with a temperate climate. The species include: *Pterocarya pterocarpa*, *Castanea sativa*, *Zelkova carpinifolia*, *Diospyros lotus*, *Acer insigne*, *Parrotia persica*, *Fagus orientalis*, *Rhamnus imeretina*, *Rhododendron ponticum*, *Buxus sempervirens*, *Ilex aquifolium*, *Laurocerasus officinalis*, *Pinus pithyusa*, *P. eldarica*, and *Quercus iberica*. According to the author, these species evolved in, and had characters

typical for, an area that had a tropical or subtropical climate in former times, but were able during the Ice Age to adapt themselves to the new conditions and to develop new hereditary characters, while still retaining some of the older ones to a greater or lesser extent, e.g. the ability to begin seasonal growth without the stimulus of cold weather, and to revert to the evergreen habit; repeated or continuous flowering; more than one period of shoot growth per growing season; cauliflory; unprotected buds, etc.

165.3/.7. Heredity, Genetics and Breeding; Variation

See also Nos. 181, 264, 268, 372–83, 391, 762, 947, 989–90, 1000, 1214–5.

140. AL'BENSKIJ, A. V. Metody ulučšenija drevesnyh porod. [**Methods of improving tree species.**] Goslesbumizdat, Moscow & Leningrad. 1954. pp. 210. 70 refs. [Russ.] C.G.B.

A handbook of forest tree breeding in the U.S.S.R., covering the use of thinnings, acclimatization, criteria for distinguishing forms within forest tree species, methods of tending young trees and of improving seedbearing, hybridization, and cases of hybrid vigour. A chapter is devoted to breeding in each of the following genera: Spruce; Larch; Pine; Birch; Oak; Elm; Maple; Lime; Walnut; Poplar; Ash; and bushes (e.g. Hazel, Currants). [Cf. 3-page abstr. in *Plant Breed. Abstr.* 27 No. 4492.]

141. LARSON, P. R. **Effect of gibberellic acid on forcing hardwood cuttings for pollen collection.** *Tech. Note Lake St. For. Exp. Sta.* No. 538, 1958. pp. 2.

Flowering cuttings of 5 tree species treated with 0·25% or 1% gibberellic acid by weight in lanolin, applied to the terminal wounds, shed pollen earlier than the controls, *Betula papyrifera* by 16 days and *Prunus pennsylvanica* and *Acer rubrum* by 9 days. All cuttings of *Populus grandidentata* and *P. tremuloides* began shedding pollen on the same date. No difference was observed between the two concentrations.

142. SEITZ, F. W. Frühtreibversuche mit Blühreisern der Aspe. [**Experiments in the forcing of flowering branches of Aspen.**] *Silvae Genet.* 7 (3), 1958 (102–5). 8 refs. [G.g.e.f.]

From mid-August until December 1957 fresh branches were collected from a ♂ Aspen and subjected to different degrees of chilling before being transferred to the greenhouse. Normal ripe pollen was produced by the flowers, the first being produced on 19 Sept. 1957.

143. HESSELTINE, C. W., and SNYDER, E. B. **Attempts to freeze-dry Pine pollen for prolonged storage.** *Bull. Torrey bot. Cl.* 85 (2), 1958 (134–5). 2 refs. O.B.D.

A report on unsuccessful attempts to adapt to *Pinus palustris* pollen methods used to treat fungus spores for storage.

144. SAKAI, K. **Theoretical studies on the technique of plant breeding. IV. The estimation of genetic correlations in forest-tree breeding and its application.** *Japanese Journal of Breeding* 7, 1957 (83–6). [Jap.] From *abstr.* in *Plant Breed. Abstr.* 28 (3), 1958 (No. 3417).

145. TODA, R. **Variation and heritability of some quantitative characters in *Cryptomeria*.** *Silvae Genet.* 7 (3), 1958 (87–93). 3 refs. [E.e.f.g.]

Heritability in its broad sense, i.e. the relative amount of total genetic variance in phenotypic variance, was estimated in a population of seedling origin by comparison with a vegetatively propagated population of *Cryptomeria japonica* of about the same age (ca. 40 years). Heritability of tree height, stem girth, taper, crown diameter, bark thickness, and angle of the longest branch, was very high, and great increases in timber production should result from the selection of the best 1% or 5% of a population and their propagation by cuttings. *From author's summary.*

146. PRIEHÄUSSER, G. Die Fichten-Variationen und -Kombinationen des Bayr. Waldes nach phänotypischen Merkmalen mit Bestimmungsschlüssel. [**Spruce variations and combinations in the Bavarian Forest, according to phenotypic characters, with a key for identification.**] *Forstwiss. Cbl.* 77 (5/6), 1958 (151–71). 13 refs. [G.]

[Cf. *F.A* 17 No. 2472.] Tabulates and discusses the following differences between the 6 known variants of *Picea abies*, and 6 combinations of them: (1) the presence or absence of glandular hairs on the pulvini; (2) needle shape, colour etc.; (3) height and girth growth; (4) branching habit; (5) crown form; (6) appearance of stem bark; (7) fertility; (8) frequency and distribution of the variants; and (9) behaviour in response to environmental extremes. Two identification keys for the variations and combinations, one based on (1) and (4), and the other on the form of the cone-scales, are drawn up.

147. CVRKAL, H. Příspěvek k rozlišování odrůd borovice lesní (*Pinus sylvestris L.*). [**Distinguishing varieties of *P. sylvestris*.**] *Sborn. čsl. Akad. zeměd. (Lesn.)* 4 (4), 1958 (213–28). 13 refs. [Cz.russ. g.]

The method of Sutherland's *n/d* diagram was used to determine differences in the essential oils of *P. sylvestris* from several European countries. Its accuracy was checked by infra-red spectrum and chromatographic methods, and found to be sufficient. The possibilities of using the method with other conifers, and of its uses in breeding and genetic studies, are discussed.

148. FOWLER, D. P., and HEIMBURGER, C. **The hybrid *Pinus peuce* Griseb. x *Pinus strobus* L.** *Silvae Genet.* 7 (3), 1958 (81–6). 19 refs. [E.e.f.g.]

A study was made of Pines intermediate between *Pinus peuce* and *P. strobus* found growing at Macdonald College, Que., Canada, using the hybrid index method. The results, added to the fact that the progeny were from a single *P. peuce* growing with *P. strobus* in the Dominion Arboretum, Ottawa, made their hybrid origin highly probable. Cone and seed characters found useful in separating *P. peuce*, *P. strobus* and the intermediate form were cone shape, seed- and wing-length, shape of cone scales

and seed-coat thickness. The value of this hybrid in breeding rust-resistant White Pine is discussed. *From authors' summary.*

149. McGregor, W. H. D., and Kramer, P. S. **The effect of photoperiod on photosynthesis, respiration and growth of Loblolly Pine seedlings from two sources.** *Abstr.* in *Plant Physiol.* 32 (Suppl.), 1957 (x–xi). [Also, more briefly, in *Rep. Stheast. For. Exp. Sta.* 1957 (22–3).] O.R.E.

Even-aged seedlings of Florida and Georgia provenances differing ca. 300 miles in latitude and 500 ft. in altitude were grown under photoperiods of 15 and 9·5 hours. In % of initial size, Florida seedlings grew more than Georgia ones, but the latter photosynthesized at a higher rate (measured as CO_2 exchange) per seedling. Both provenances photosynthesized at a higher rate, and grew more, under long-day conditions. Differences in photosynthetic rate were related to seedling size. Reduced to unit of plant (top) volume there were no differences between provenances or treatments. There appeared, however, to be a tendency for larger seedlings to respire more slowly per unit of top volume.

150. Habeck, J. R. **White Cedar [*Thuja occidentalis*] ecotypes in Wisconsin.** *Ecology* 39 (3), 1958 (457–63). 6 refs.

Collections of White Cedar wildings from upland (*a*) and lowland (*b*) habitats were made for transplanting into a cold frame, and seed was also collected from the same sites for germination tests and seedling growth and development studies. Survival of (*a*) transplants was significantly higher than that of (*b*). Germination of (*a*) seed was also significantly higher than that of (*b*) seed. Growth of seedlings in 3 combinations of soil and moisture gave clear indication of genetic differences between (*a*) and (*b*) White Cedar: (*a*) seedlings displayed a great plasticity in their root development, producing relatively long root systems in well drained soils and short root systems in saturated soils; (*b*) seedlings displayed fairly constant root development in both types of soil. The results of this investigation prove conclusively that ecotypes exist in the White Cedar populations of Wisconsin, within a relatively small geographical area. *From author's summary.*

151. Day, W. R. **Variations in susceptibility of European Larch of differing seed origin in Scotland to injury by experimental freezing.** *Scot. For.* 12 (3), 1958 (143–6). 3 refs.

A series of experiments is described in which specimens [2-year potted transplants] of *Larix decidua* of 12 different Scottish provenances were subjected to freezing in a refrigerator at 13–19° F. (for 3 days in early April), 19–25° (3 days, early May), and 22–28° (3 days, late May). The results of damage to the plants are tabulated, and it is shown that some provenances are relatively resistant to frost, especially during the early stages of flushing, as compared with others. [Cf. *F.A.* 13 No. 1282.]

152. Nienstaedt, H. **Height growth is indicative of the relative frost resistance of Hemlock seed sources.** *Tech. Note Lake St. For. Exp. Sta.* No. 525, 1958. pp. 2. 2 refs.

When planted out at Rhinelander, Wis., 4-year-old seedlings of *Tsuga canadensis* from 17 seed sources showed a close correlation between the amount of frost injury and the length of growing season at the place of origin of the stock. From earlier experiments, not published, it appears that total elongation is related primarily to the duration of growing season rather than to rate of growth. Results suggest that relative frost resistance can therefore be predicted from small indoor tests of growth performance.

153. Gabriel, W. J. **Genetic differences in juvenile Shumard Oak.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 81, 1958. pp. 3. 1 ref.

When seed of *Quercus shumardii* var. *shumardii* from 4 provenances was sown at the Michaux Quercetum, Philadelphia, in 1954, seedlings from southern provenances had the best height growth after 1 growing season as a result of a longer period of growth. In some cases autumn coloration was delayed till mid-November. They also, however, suffered most from frost damage in autumn/winter 1954. Dieback of seedlings from Florida averaged 28 cm., while those from Illinois escaped injury, so that differences in height growth after two growing seasons were not significant.

154. Rao, H. S. **Two genetical notes. I. Natural genetic ratios in *Reinwardtia trigyna* Planch. II. A putative hybrid Cassia [*Cassia fistula* × *C. javanica*].** *Indian For.* 84 (5), 1958 (270–2 + 1 plate). 6 refs.

155. Saarnijoki, S. Über die Loimaa-Birke nebst einigen anderen in Finnland hauptsächlich zu Zierzwecken gezogenen schlitzblättrigen Birken. **[The Loimaa Birch and other cutleaved Birches grown in Finland mainly for ornamental purposes.]** *Commun. Inst. for. Fenn.* 47 (3), 1956 (1958). pp. 30. 68 refs. [G.fi.]

Describes a number of cutleaved forms of *Betula verrucosa*.

156. Illies, Z. M. Polysomatie im Meristem von Einzelbaumabsaaten bei *Picea abies*. **[Polysomaty in the meristem of the progeny of single trees of *P. abies*.]** *Silvae Genet.* 7 (3), 1958 (94–7). 10 refs. [G.g.e.f.]

Seedlings with abnormally short and thick shoots and needles, found among the progeny of single trees of *Picea abies*, differed from morphologically normal seedlings by showing mixoploidy in the meristem. Newly germinated embryos of the same progenies showed similar abnormalities in the embryological tissue. Because the abnormal seedlings had at 3 years of age the appearance of dwarf Spruces, cytological studies were also made of 18 dwarf Spruces 50 years of age. Six of these showed the same abnormalities as the seedlings under study. It is concluded that the abnormalities observed are the results of pathological polysomaty. *From author's summary.*

157. Durrieu-Vabre. Chromosomes de *Pseudotsuga douglasii* Carrière. **[Chromosomes of *P.*

taxifolia.] *C.R. Acad. Sci., Paris* 246 (26), 1958 (3660–3). 2 refs. [F.f.] O.R.S.

Concludes from a study of abundant material that $n = 12$ for *P. taxifolia*; a small amount of material suggests that *Pseudolarix amabilis* has the same chromosome number.

158. HAIR, J. B., and BEUZENBERG, E. J. **Chromosomal evolution in the Podocarpaceae.** *Nature, Lond.* 181 (4623), 1958 (1584–6). 4 refs.

There is in general a correlation between the stability of chromosome numbers and the length of the reproductive cycle, reaching an extreme in the unvarying basic numbers of most families of slow-growing, long-lived trees composing the gymnosperms. Investigation of the Podocarpaceae, however, shows an exception to the rule of constancy; far from being stable, they show a surprising variation in chromosome numbers, ranging from $2n = 38$ to $2n = 18$. Data from 52 species covering all the genera of the family, are tabulated and analysed. It is suggested that a progressive reduction in basic number may be a major factor in chromosome evolution in the Podocarpaceae.

159. KEEN, R. A. **A study of the genus *Taxus*.** *Abstr. of thesis*, in *Dissert. Abstr.* 18 (4), 1958 (1196–7). O.R.S.

A cytogenetic study of the chromosomes of *Taxus* for possible taxonomic use gave negative results. Diploid somatic chromosomes from root-tips proved unsuitable for study. Haploid somatic chromosomes from ♀ gametophytes in early July made excellent aceto-carmine smears. Meiosis occurs in the pollen mother cells in late September and early October at Wooster, Ohio. The haploid number of chromosomes in *Taxus* is 12, with very minor differences in the number of chiasmata between species. The following species with a number of cultivars and clones are discussed: *T. baccata*, *T. brevifolia*, *T. canadensis*, *T. chinensis*, *T. cuspidata*, *T. floridana*, *T. hunnewelliana*, and *T. media*. The 'living herbarium of *Taxus*' at the Ohio Agricultural Experiment Station is proposed as the basis for a national register of *Taxus* nomenclature.

160. PATIL, R. P. **Chromosome numbers of some dicotyledons.** *Curr. Sci.* 27 (4), 1958 (140). 6 refs. A.P.B.

Clerodendron infortunatum, *Albizzia lebbek*, *Indigofera pulchella*, *Dalbergia sissoo*, *Rhizophora mucronata*, *Croton bonplandianum* and *Alstonia macrophylla*.

161. BARLOW, B. A. **Diploid and tetraploid *Casuarina littoralis* Salisb. (Syn. *C. suberosa* Ott. and Dietr.).** *Aust. J. Bot.* 6 (1), 1958 (38–46 + 2 plates). 12 refs. O.B.D.

Within the species *C. littoralis* there are diploid and tetraploid forms having 22 and 44 chromosomes respectively. Previous records of $2n = 48$ are erroneous. The tetraploid form has an almost continuous distribution in Australia and Tasmania, the diploid a small disjunct distribution in New South Wales and Queensland. Under certain conditions hybridization has occurred. *Author's summary.*

168. Histology

See also Section 811 and Nos. 133, 177.

162. GJØNNES, B. **[Biochemical studies on Spruce tissue.]** *Beretn. Regnskap Skogbr. Skogind. ForsknForen. SkogforsknGruppe 1957*, 1958 (11–3). [Nor.]

Describes the effect of light and of variations in the medium on differentiation and development of tissue cultures of the excised embryo and apical meristem of Spruce.

163. TRONCHET, A., and MONTAUT, M.-T. Le développement vasculaire dans la plantule du *Viscum album* et la nature morphologique du suçoir. **[Vascular development in the seedling of *V. album* and the morphology of the haustorium.]** *Bull. Soc. bot. France* 105 (1/2), 1958 (27–31). 6 refs. [F.] O.B.D.

17. Systematic Botany

172.8. Eumycetes (True Fungi)

See also Nos. 692 *et seq.*, 1152 *et seq.*

164. THIERS, H. D. **The Agaricaceae of the Pine belt and adjacent areas in Eastern Texas.** *Abstr. of thesis*, in *Dissert. Abstr.* 18 (4), 1958 (1233). O.R.S.

Discusses the environmental conditions and describes the 52 genera and 200 species accurately determined. The terrestrial species were most, and coprophilous species least frequent, with lignicolous ones intermediate.

165. CHEVAUGEON, J. ***Ceratocystis fimbriata.* Ellis et Halstead.** *Rev. Mycol., Paris* 22, *Suppl. Colon.* No. 2, 1957 (45–60). 42 refs. [F.] I.M.I.

Covers synonymy, distribution (mainly tropical), hosts (*Hevea*, *Cocos*, *Platanus occidentalis* and *P. orientalis*, *Coffea*, Cacao, and sweet potato), symptoms ('mouldy rot'), penetration and transmission, morphology, laboratory culture, biology and control.

174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists

See also Nos. 1010–11.

166. **International code of nomenclature for cultivated plants formulated and adopted by the International Commission for the Nomenclature of Cultivated Plants of the International Union of Biological Sciences.** International Bureau for Plant Taxonomy and Nomenclature, Utrecht. 1958. pp. 28.

167. RAIZADA, M. B. **Name changes in common Indian plants.** *Indian For.* 84 (8), 1958 (467–538).

Lists alphabetically the valid names and important synonyms of 815 species, including numbers of trees and shrubs but no grasses.

168. **A.E.T.F.A.T.–index 1957. Index of the papers on systematic phanerogamy and of the new taxa concerning Africa south of the Sahara and Madagascar.** Association pour l'Étude Taxonomique de la Flore d'Afrique Tropicale, Brussels. 1958. pp. 61. [F.E.] [Cf. *F.A.* 19 No. 129.]

169. AUBRÉVILLE, A., and PELLEGRIN, F. Nouveautés de Côte d'Ivoire. **[New species from the Ivory Coast.]** *Bull. Soc. bot. France* 105 (1/2), 1958 (34–5). [F.] O.B.D.

Includes descriptions of *Cassipourea hiotou* and *Hymenodictyon gobiense* spp. nov.

170. STEARN, W. T. **A key to West Indian Mangroves.** *Kew Bull.* 1958 (1), (33–7). Many refs.

The key, based largely on leaf characters, covers *Avicennia germinans* comb. nov. (*Bontia germinans*), *A. schaueriana*, *Conocarpus erectus* (2 vars.), *Laguncularia racemosa*, *Rhizophora harrisonii*, *R. mangle* and *R. racemosa*.

171. WILSON, P. G. **Contributions to the flora of Tropical America: LXIII. Plantae Hintonianae: XII.** *Kew Bull.* 1958 (1), (155–70).

New woody species described are: *Forchhammeria hintonii*, *Bursera crenata*, *B. sarcopoda*, *Cassia multifoliolata*, *Gonolobus megalocarpus* and *Pseudomarsdenia lanata*, all from Mexico.

172. WOODSON, R. E., JR., *et al.* **Flora of Panama. Part V. Fascicle 3. Leguminosae.** *Ann. Mo. bot. Gdn.* 38, 1951 (1–94). O.B.D.

173. MAGNANINI, A., and FILHO, A. DE MATTOS. Notas sôbre a composição das florestas costeiras ao norte do Rio São Matheus (Espirito Santo, Brasil). **[Notes on the composition of the coastal forests to the north of the São Matheus river (Espirito Santo, Brazil).]** *Arq. Serv. flor., Brasil* 10, 1956 (163–97). 11 refs. [Port.]

Presents a list of species in alphabetical order of native names, with information on habitat, growth, frequency of occurrence and local uses.

174. **Forest trees of Australia.** Commonwealth Forestry and Timber Bureau, Canberra. 1957. pp. 230.

Gives one-page descriptions of ecology, distribution, and morphology with a facing page of photographs, for 82 native Australian forest tree species (including 67 Eucalypts). There are also general descriptions of several natural groups of species, e.g. 'Bloodwoods', 'Stringybarks' etc.

174.2/.7. Gymnosperms

See also Nos. 146–8, 159.

175. CHUN, W.-Y., and KUANG, K.-Z. Novyj rod Pinaceae *Cathaya* Chun et Kuang gen. nov. iz južnogo i zapadnogo Kitaja. **[*Cathaya* Chun et Kuang, a new genus of Pinaceae from southern and western China.]** *Bot. Ž.* 43 (4), 1958 (461–70 + 6 sets of drawings, 4 plates). [Russ.Latin, e.]

Describes *C. argyrophylla* sp. nov., a tree up to 20 m. high and 40 cm. diam. from Kwangsi, with many illustrations (including pollen, needle anatomy and habit) and *C. nanchuanensis*, known as yet only from vegetative material from Szechuan, with illustrations of needle anatomy. The fossil *C. loehri* comb. nov. (*Keteleeria l.*) from the Upper Pliocene in Germany is also referred to this genus, which is not closely allied to any other genus in the family. [Cf. *F.A.* 20 No. 940.]

175.2. Monocotyledons

176. MCCLURE, F. A. **The taxonomic conquest of the Bamboos with notes on their silvicultural status in the Americas.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (410–4). [E.]

Discusses the difficulties of identifying Bamboos from the inadequate herbarium material usually available, and makes suggestions for improved techniques of collection etc.

176.1. Dicotyledons

See also Nos. 154–5, 161, 228–9.

177. WOOD, C. E., JR. **The genera of woody Ranales in the Southeastern United States.** *J. Arnold Arbor.* 39 (3), 1958 (296–346). Many refs.

Includes Ranalian families of predominantly woody habit, with characteristic Ranalian ethereal-oil cells—Magnoliaceae, Anonaceae, Illiciaceae, Schisandraceae, Canellaceae, Calycanthaceae, and Lauraceae—with descriptions and lists of references for the families and genera, and keys to the latter.

178. CHAO, A.-C. **[A census of the Chinese species of Combretaceae.]** *Acta phytotax. sinica* 7 (3), 1958 (225–52 + 3 sets of drawings, 8 photos). 23 refs. [Chin.e.]

Describes 5 *Terminalia* spp., 11 *Combretum* spp., *Lumnitzera littorea*, and *Quisqualis indica*.

179. HAUMAN, L. Deux *Dichapetalum* nouveaux d'Afrique central. **[Two new *Dichapetalum* spp. [*D. michelsonii* and *D. bullockii*] from central Africa.]** *Bull. Jard. bot. Brux.* 28 (1), 1958 (73–5). [F.] O.B.D.

180. WHITE, F., and BARNES, R. D. **Generic characters in the Ebenaceae.** *J. Oxf. Univ. For. Soc.* (*Ser. 4*) No. 6, 1958 (31–4 + 4 photos). 9 refs.

The flowers and fruit of 5 species of *Royena* were examined, and 20 characters thought to be of taxonomic value were assessed. It appears that the distribution of the sex organs in both *Royena* and *Diospyros* is more variable than has been supposed and cannot be used as a criterion for their separation. There are also striking similarities in the wood of e.g. *R. sericea*, *D. mespiliformis* and *D. abyssinica*.

181. MIŠIĆ, V. Varijabilitet i ekologija bukve u Jugoslaviji. **[The variability and ecology of Beech in Jugoslavia.]** *Posebn. Izd. biol. Inst. N.R. Srbije* No. 1, 1957. pp. 181 + 8 plates, 1 tbl. [Serb.e.]

Presents results of studies, from 1952–56, on the morphology and ecology of Beech at 44 localities in Serbia, Croatia, Slovenia, Macedonia and Bosnia. Studies included the variability of organs of the same tree, variability between trees in an ecologically uniform habitat, and variability between groups or stands in different habitats. The author concludes that Beech in Jugoslavia belongs to the species *Fagus moesiaca*, which he places midway between *F. orientalis* and *F. sylvatica*. Morphological differences between the 3 species are compared and their evolution and taxonomy discussed. Three ecotypes of *F. moesiaca* in Jugoslavia—submontane (700-1100 m), mid-montane and subalpine—are distinguished ecologically and by morphological characters (chiefly of the cupule) and described. From data

in literature and examination of leaf specimens it is claimed that *F. moesiaca* occurs in Italy, Poland, Hungary, S. France and Greece.

182. HARDIN, J. W. **A monographic study of the American Hippocastanaceae.** *Abstr. of thesis*, in *Dissert. Abstr.* 18 (4), 1958 (1229–30). O.R.S. [Cf. *F.A.* 19 No. 2757.]

183. VATTIMO, I. DE. Nota prévia sôbre as espécies de *Ocotea* Aubl. que ocorrem no estado do Paraná (Lauraceae). **[Preliminary note on the species of *Ocotea* occurring in the state of Paraná.]** *Arq. Serv. flor., Brasil* 10, 1956 (109–23). 8 refs. [Port.]

Notes on distinguishing characters, with a key to the species.

184. KOSTERMANS, A. J. G. H. Le genre *Ravensara* Sonn. (Lauracées) à Madagascar. **[The genus *Ravensara* in Madagascar.]** *Bull. Jard. bot. Brux.* 28 (2), 1958 (173–91 + 6 plates). [F.e.] O.B.D.

Ten new species are described, one not named.

185. HILLCOAT, D., and BRENAN, J. P. M. **The identity of *Acacia horrida* (L.) Willd.** *Kew Bull.* 1958 (1), (39–40). Several refs.

A. horrida antedates, and must replace, *A. latronum*; *A.l.* subsp. *benadirensis* becomes *A. horrida* subsp. *benadirensis* comb. nov.

186. LÉONARD, J. Genera des Cynometreae et des Amherstieae africaines (Leguminosae-Caesalpinioideae). Essai de blastogénie appliquée à la systématique. **[The genera of African Cynometreae and Amherstieae—seedling characters as a guide to systematy.]** *Mémoires de l'Académie Royale de Belgique, Classe des Sciences, Bruxelles* 30 (2), 1957. pp.312. Many refs. [F.f.e.] O.R.S.

Establishes for the 'good' genera of these tribes a strict correlation between general morphological and pollen characters, wood anatomy and seedling characters studied in laboratory germinations, and confirms that the last are a valuable aid also for the delimitation of species within complicated heterogeneous genera. Among these are *Cynometra*, which loses 17 species, *Macrolobium*, now excluded from Africa with the loss of 53 species to other genera, and *Copaifera*, losing 12 species. For *Berlinia*, Hauman's general outline is accepted. The classification proposed (which is as natural as possible) comprises 50 genera and 307 species, 8 genera being sunk, 4 re-established and 7 new, erected with 24 new species. More than 100 species are referred (with apologies) to new combinations (other genera). There are numerous drawings and photographs of seedlings.

187. BRENAN, J. P. M. **A cultivated species of *Cassia* allied to *C. javanica*.** *Kew Bull.* 1958 (1), (180).

C. agnes sp. nov. (*C. javanica* var. *agnes* De Wit), cultivated in Entebbe (Uganda), Yangambi (Belgian Congo) and elsewhere in the tropics; probably a native of Indo-China and/or Siam.

188. FIDALGO, O. Contribuição ao estudo de *Clitoria racemosa* Benth., G. 1838. **[Contribution to the study of *C. racemosa*.]** *Arq. Serv. flor., Brasil* 10, 1956 (1–108). 99 refs. [Port.]

Considers the systematy of the genus *Clitoria* and presents a detailed study of the morphology and anatomy of *C. racemosa*, with data on the chemical composition of the seed and its oil.

189. LEROY, J. F. Les acajous de Madagascar (*Khaya* et *Neobeguea*). **[The Mahoganies of Madagascar (*Khaya* and *Neobeguea*).]** *C.R. Acad. Sci., Paris* 246 (16), 1958 (2639–41). [F.] O.R.S.

Discusses the species found and their nomenclature, and lists the taxonomic characters distinguishing the two genera.

190. CAVACO, A. Sur le genre *Decarydendron* (Monimiacées). **[The genus *Decarydendron* (Monimiaceae).]** *Bull. Soc. bot. France* 105 (1/2), 1958 (38–9). [F.] O.B.D.

Describes *D. perrieri* sp. nov., a small tree.

191. CAVACO, A. Remarques sur les genres '*Schrameckia*' et '*Hedycaryopsis*', et un nom nouveau pour une espèce de *Tambourissa* (Monimiacées). **[Remarks on the genera *Schrameckia* and *Hedycaryopsis*, and a new name for a species of *Tambourissa* (Monimiaceae).]** *Bull. Soc. bot. France* 105 (1/2), 1958 (39–41). [F.] O.B.D.

(1) The genus *Schrameckia* is transferred to *Tambourissa* to give a new subgenus. *T. floricostata* nom. nov. (=*S. madagascariensis*). (2) Describes 3 new species of *Hedycaryopsis*, viz. *H. perrieri*, *H. capuronii* and *H. tsaratanensis*.

192. BULLOCK, A. A., and HARRISON, S. G. **The correct name for the Clove.** *Kew Bull.* 1958 (1), (52). Several refs.

The correct name appears to be *Eugenia caryophyllus* comb. nov. if the species is classified under *Eugenia*.

193. AMSHOFF, G. J. H. **Notes on Myrtaceae. VII. Myrtaceae of French Equatorial Africa.** *Acta bot. neerland.* 7 (1), 1958 (53–8). [E.] O.B.D.

Includes descriptions of *Eugenia librevillensis* and *E. gabonensis* spp. nov.

194. FERNANDES, A., and FERNANDES, R. Contribuição para o conhecimento das Passifloraceae da Guinea Portuguesa. **[The Passifloraceae of Portuguese Guinea.]** *Repr.* from *Garcia de Orta, Lisboa* 5 (4), 1957 (705–10). [Port.f.e.]

195. PETIT, E. Les Naucleeae (Rubiaceae) du Congo Belge et du Ruanda-Urandi. 2. *Mitragyna* et *Nauclea*. **[The Naucleeae (Rubiaceae) of the Belgian Congo and Ruanda-Urandi. 2. *Mitragyna* and *Nauclea*.]** *Bull. Jard. bot. Brux.* 28 (1), 1958 (1–13). [F.] O.B.D.

Notes on 4 species of *Mitragyna* and 5 of *Nauclea*, with keys to the species.

196. MÜLLER, R. Altstammsorten der Schwarzpappelbastarde. IIe.—Die 'Eckhof'-Pappel. IIf.—Die 'Eukalyptus'-Pappel. **['Old stock varieties' of Black Poplar hybrids. IIe.—The 'Eckhof' Poplar.**

IIf.—**The 'Eucalyptus' Poplar.**] *Holz-Zbl.* 84 (76; 77), 1958 (993; 1009–10). 11 refs. [G.]

[Cf. *F.A.* 19 No. 3856.] The 'Eckhof' Poplar includes some clones distributed as *P.* 'regenerata Hüttenfeld'. Varieties going under the names 'regenerata erecta' and 'virginiana' are identified with the 'Eucalyptus' Poplar.

197. SAUER, E. Altstammsorten der Schwarzpappelbastarde. IIg. Bestimmungstabelle für die Baumschulpflanzen der Altsorten. [**'Old stock varieties' of Black Poplar hybrids. IIg. Key to nursery plants.**] *Holz-Zbl.* 84 (89), 1958 (1149). [G.]

Contains a dichotomous key to the 16 main 'old stock varieties' and some less common clones, based on the criteria previously discussed, and a second key showing the distinguishing characters of the 16 main varieties in relation to those resembling them most closely.

198. FROILAND, S. G. **The genus *Salix* in the Black Hills of South Dakota: a phytogeographical study.** *Abstr. of thesis*, in *Dissert. Abstr.* 19 (1), 1958 (29). O.R.S.

In the Black Hills area the Cordilleran flora, the Plains flora, the Northern Lowland flora and the Eastern Deciduous forest element meet and overlap. The study of the genus *Salix* was undertaken because it includes representatives of all the geographical elements involved, the object being to determine the Willow species present, their taxonomic characteristics, geographical distribution and present status. Of the 21 species and varieties collected, 1 is eastern North American, 2 N.E. North American, 3 Boreal, 9 Cordilleran, 3 Central North American, 1 Western North American and 2 are introduced. Moisture appears to be the limiting factor for Willow distribution in the Black Hills. Further research is proposed.

199. HAUMAN, L. Quelques Sapindacées du Congo Belge. [**Some Sapindaceae of the Belgian Congo.**] *Bull. Jard. bot. Brux.* 28 (2), 1958 (93–109). [F.] O.B.D.

New trees described are: 5 spp. of *Allophylus*, 3 of *Deinbollia*, 1 of *Haplocoelum*, 1 of *Placodiscus* and 1 of *Eriocoelum*.

200. AUBRÉVILLE, A., and PELLEGRIN, F. Réhabilitation de deux genres de Sapotacées. [**Restitution of two genera of the Sapotaceae.**] *Bull. Soc. bot. France* 105 (1/2), 1958 (35–7). [F.] O.B.D.

Reinstates the genus *Zeherella* (Pierre ms.), type sp. *Z. megalismontana* (= *Chrysophyllum megalismontanum*) and erects a new genus *Boivinella*, type species *B. natalensis* (= *C. natalensis*), with the following new combinations, *B. glomerulifera*, *B. wilmsii*, *B. argyrophylla* and *B. kilimandcharica*.

201. SCHULTES, R. E. **A synopsis of the genus *Herrania*.** *J. Arnold Arbor.* 39 (3), 1958 (216–95).

Includes historical notes, systematy, ecology, uses, a specific key, and descriptions of 17 species and 3 varieties, with indexes to exsiccatae and native names. These 9- to 30-ft. trees, occurring in dense forests and savannas from Nicaragua to the Amazon basin and both Andean slopes, are saved in agricultural clearings for their fruits. The genus is closely allied to *Theobroma* and may have interest for breeding disease-resistant Cacao.

18. Plant Ecology

202. VIDAL, J. La végétation du Laos. 1re partie: Le milieu (conditions écologiques). [**The vegetation of Laos. Part 1: The environment (ecological conditions).**] *Trav. Lab. for. Toulouse* Tome 5 (Sect. 1), Vol. 1, Art. 3, 1956. pp. 120 + 35 photos, 7 maps. 210 refs. [F.]

Describes the topography, soils, climate etc. from an ecological point of view.

181. Mode of Life, Autecology. Silvicultural Characters of Trees

See also Nos. 181, 201, 364, 367, 1300.

203. EARL, D. **Yellow Cedar (*Chamaecyparis nootkatensis* (D. Don.) Spach.).** *Quart. J. For.* 52 (3), 1958 (204–7 + 1 plate). 8 refs.

Details of the natural range of *Chamaecyparis nootkatensis*, its preferred sites and usual associations, are given together with notes on some of its characters, its timber, and the history of the species in Britain.

204. BROWN, J. M. B. **Ecology of Corsican Pine in Britain.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (61).

A survey of the performance of Corsican Pine in Britain, in relation to climate, topography and soil, has been in progress. Particular attention has been given to the tree's behaviour in areas affected by smoke in S. Yorkshire. Atmospheric pollution considerably restricts the choice of species, and there is demand for a tree that combines general climatic tolerance on the Pennine uplands with ability to sustain healthy growth in spite of pollution. The limitations to the use of Corsican Pine in the Pennines appear to be due rather to general unsuitability of the climate than to ill-health caused by industrial smoke. From a preliminary examination of the relation between its site quality and the temperature factor it appears possible that temperature in the rhizosphere rather than air temperature is of principal significance in differentiating site quality in Britain. A feature of Corsican Pine stands on marginal sites is the susceptibility, usually shown only after the stand has closed canopy, to infection by the fungus *Brunchorstia destruens*. Though slow growth and susceptibility to *B. destruens* usually go together, many low-quality upland sites appear to remain unaffected by the fungus, and the particular connexion between the two may be coincidental. It is possible that severe winter cold may predispose to *B. destruens* attack in upland climates.

205. MICHÁLEK, J. Vejmutovka s hlediska biologických a ekologických požadavků. [***Pinus strobus*: its biology and ecology.**] *Sborn. čsl. Akad. zeměd. (Lesn.)* 4 (2/3), 1958 (185–92). [Cz.g.]

A monograph dealing with the tree in its native range and in Czechoslovakia, and discussing its parasites, timber production, silvicultural treatment etc.

206. ALEXANDER, R. R. **Silvical characteristics of Subalpine Fir [*Abies lasiocarpa*].** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 32, 1958. pp. 15. 29 refs. [Cf. *F.A.* 19 No. 1436.]

207. ALEXANDER, R. R. **Silvical characteristics of Engelmann Spruce [*Picea engelmannii*].** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 31, 1958. pp. 20. 40 refs.

208. RUDOLF, P. O. **Silvical characteristics of Jack Pine [*Pinus banksiana*].** *Sta. Pap. Lake St. For. Exp. Sta.* No. 61, 1958. pp. 31. 145 refs.

209. WENGER, K. F. **Silvical characteristics of Pond Pine [*Pinus serotina*].** *Sta. Pap. Stheast. For. Exp. Sta.* No. 91, 1958. pp. 13. 21 refs.

210. ROY, D. F. **Silvical characteristics of Tan Oak [*Lithocarpus densiflorus*].** *Tech. Pap. Calif. For. Range Exp. Sta.* No. 22, 1957. pp. 21. 48 refs.

211. CLARK, F. B. **Silvical characteristics of Swamp White Oak [*Quercus bicolor*].** *Misc. Release Cent. St. For. Exp. Sta.* No. 25, 1958. pp. 10. 25 refs.

212. DEITSCHMANN, G. H. **Silvical characteristics of Bur Oak [*Quercus macrocarpa*].** *Misc. Release Cent. St. For. Exp. Sta.* No. 27, 1958. pp. 17. 63 refs.

213. MARTINDALE, D. L. **Silvical characteristics of Sweetgum [*Liquidambar styraciflua*].** *Sta. Pap. Stheast. For. Exp. Sta.* No. 90, 1958. pp. 14. 53 refs.

214. MERZ, R. W. **Silvical characteristics of American Sycamore [*Platanus occidentalis*].** *Misc. Release Cent. St. For. Exp. Sta.* No. 26, 1958. pp. 20. 59 refs.

215. RENSHAW, J. F. **Silvical characteristics of Yellow Poplar [*Liriodendron tulipifera*].** *Sta. Pap. Stheast. For. Exp. Sta.* No. 89, 1958. pp. 18. 62 refs.

216. SLABAUGH, P. E. **Silvical characteristics of Bigtooth Aspen [*Populus grandidentata*].** *Sta. Pap. Lake St. For. Exp. Sta.* No. 63, 1958. pp. 16. 50 refs.

217. SCHOLZ, H. F. **Silvical characteristics of American Basswood [*Tilia americana*].** *Sta. Pap. Lake St. For. Exp. Sta.* No. 62, 1958. pp. 17. 52 refs.

218. **Management of Red Alder in the Pacific Northwest. Advisory Group on forest management (1).** Northwest Hardwood Association, Seattle. 1957. pp. 24. 58 refs. P.R.

Covers the silvics of *Alnus rubra*, thinning practices, m.a.i. and total yield, volume tables, rotations, types of felling, and logging methods. Also considers official grading rules and the judging of quality, chemical barking for pulpwood, and the relation of markets to management.

219. GENTRY, H. S. **The natural history of Jojoba (*Simmondsia chinensis*) and its cultural aspects.** *Econ. Bot.* 12 (3), 1958 (261–95). 13 refs.

Covers the distribution, environment, fauna, and seasonal cycle of the wild plant (endemic in California), its variation in habit, roots, leaf, flowers, capsules, and seeds, the yield of its liquid wax [cf. *F.A.* 20 No. 1262], propagation, tending and harvest. It has valuable wax-containing seeds and is a browse shrub for desert conditions.

220. MATSUL, Z., and MATSUZAKI, S. **[Management of Itaya-Maple [*Acer pictum*] stand.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 8, 1957 (81–110). 9 refs. [Jap.e.*e.*]

Data are given on strength (adequate for furniture, tools, skis), calorific value (fuel wood first and charcoal third in a list of 20) and browse value (attractive to sheep, goats and horses). It is good for erosion control, ornamental planting and bee-pasture. Its syrup yields a handsome profit. Data on numbers, height and volume by diam. classes are given for various mixed forests in which it occurs (on fertile clays in the northern mild temperate zone) and a yield table for Maple plantations (3 site classes) is developed from stem analyses and formulae. Suitable systems are coppice-with-standards, shelterwood, and coppice selection.

221. GEORGESCU, C. C., and TATARANU, I. O buku białokorym (*Fagus silvatica* L.f. *leucodermis* C. Georgescu et I. Tataranu) w Rumunii. **[*F. silvatica* f. *leucodermis* in Rumania.]** *Sylwan* 101 (10), 1957 (1–4). 3 refs. [Pol.G.]

Its technical properties, silvicultural characteristics and distribution.

222. MERENDI, A. La quercia sughera (*Quercus suber* L.). **[*Q. suber*.]** *Ital. agric.* 95 (7), 1958 (362–79). 12 refs. [It.] E.M.B.

Illustrated account of the Cork Oak (silviculture, harvesting of cork, pests etc.).

223. NICOLÁS, A. Consideraciones ecológicas sobre los alcornocales catalanes. **[Ecological notes on *Quercus suber* in Catalonia.]** [*Docum.*] *Wkg. Party on Ecology FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/EC/3-B*, 1958. pp. 6. [Span.] Limited distribution.

Discusses the natural distribution of the Cork Oak in this region and lists the associated species indicative of various site qualities for it.

224. HADFIELD, M. **Jupiter's tree: the Walnut in Britain.** *Quart. J. For.* 52 (3), 1958 (191–6). 18 refs.

Ancient references to the tree and its name, and to its early history in Britain are discussed. It was probably growing in this country by A.D. 1000, and in the 16th and 17th centuries large plantings were made. Notes on the raising of the tree are given.

225. WARDLE, P. **Notes on the ecology of Ash [*Fraxinus excelsior*].** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (107–8).

Measurements were made at many localities in the British Isles. The compensation point of Ash seedlings was found to be at a daylight factor of ca.

9%; under dense *Mercurialis perennis* light intensity is below this minimum and Ash seedlings soon disappear as a result of damping off. Slowly growing seedlings persist when the *M. perennis* is itself shaded out, and commence rapid growth when gaps occur in the canopy. Natural Ash woods occur where dry or unstable soils favour Ash at the expense of ground vegetation. Ash is absent on soils with a pH < 4·2 and altitudinal limits are probably set by acidic soil conditions rather than by climate. Good Ash sites occur over a pH range of 5–8, though chlorosis is sometimes seen on basic soils. Roots are concentrated in the top 10 cm. of soil, most of the fine roots live only one year but the coarser roots grow rapidly and persist indefinitely, the latter tolerating periods of waterlogging, but the suppression of the fine rootlets by a high water table produces symptoms of drought in trees.

226. BINDSEIL. Die Vogelkirsche als Waldbaum. [***Prunus avium* as a forest tree.**] *Holz-Zbl.* 84 (80), 1958 (1039). [G.]

Advocates a wider use of this tree, describing its (modest) site requirements, timber properties, growth etc. It is particularly recommended for forest margins and roadsides, where pruning and tending are easier and the trees have sufficient light.

227. JAKŠINA, A. M. K biologii *Haloxylon ammodendron* (C.A.M.) Bge. v pustynnoj stepi Mongol'skoj Narodnoj Respubliki. [**The biology of *H. ammodendron* in the desert-steppe of the Mongolian People's Republic.**] *Bot. Ž.* 43 (2), 1958 (249–62). 20 refs. [Russ.]

228. BASCOPÉ, F., *et al.* Descripciones de árboles forestales No. 4. El género *Anacardium* en América. [**Descriptions of forest trees No. 4. The genus *Anacardium* in America.**] Instituto Forestal Latino Americano de Investigación y Capacitación, Mérida. 1958. pp. 18 + 1 tbl. + 5 plates. 38 refs. [Span.e.]

Distribution, description of the species, habitat, silviculture, pests and diseases, and anatomy, properties and uses of the wood, with special reference to *A. rhinocarpus* and *A. occidentale*.

229. COZZO, D. Eucalyptus y eucaliptotecnia. [**Eucalypts.**] 'El Ateneo' Librería Editorial, Buenos Aires, 1955. pp. 393. 107 refs. [Span.]

A comprehensive monograph, discussing distribution in Australia and acclimatization elsewhere. The characteristics of the genus are described, with notes on roots, leaves, flowers, fruit, seed, the stem, and timber, and the various species and hybrids discussed, individual descriptions being given of the more important species. The adaptability of Eucalypts, site requirements, methods of sowing and transplanting, preparations for planting, lay-out of plantations, subsequent care and protection, exploitation, yields, and timber uses are dealt with. Indexes of 59 English and 11 Argentine names, with their scientific equivalents, are given, together with an index of the botanical names of the 180 species and hybrids mentioned in the book.

230. HEWETSON, C. E. **Other species (Sal).** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (473–83). [E.f.]

Notes on site factors, silvicultural characters, silviculture, and protection of *Shorea robusta* in India, and research on it (both current and future).

231. DOW, T. M. **The Dom Palm.** *J. Oxf. Univ. For. Soc.* (*Ser. 4*) No. 6, 1958 (48–53). 5 refs.

A note on the botanical and silvicultural characters and utilization of *Hyphaene thebaica*.

181.1. Distribution, Natural Range

See also Nos. 198, 278–9.

232. HOFMANN, A. Sull' ecologia di una nuova stazione avellinese di pino loricato. [**The ecology of a new locality for *Pinus leucodermis* near Avellino.**] *Ital. for. mont.* 13 (2), 1958 (63–76). 21 refs. [It.f.]

233. MAGIC, D. Jaseň úzkolistý (*Fraxinus angustifolia* Vahl.) na Slovensku. [***F. angustifolia* in Slovakia.**] *Lesn. Čas.* 3 (4), 1957 (269–91). 92 refs. [Slovak.russ.g.]

Discusses the morphology of *F. angustifolia*, which has been discovered in S.W. Slovakia and in Hungary, an extension northwards of its natural range.

181.2. Atmospheric Relations. Acclimatization

See also Nos. 7, 107–8, 110–2, 120–1, 149, 151–3, 225, 268–70, 272, 358 *et seq.*, 951–2.

234. TRACI, C. Cultura cătinei albe (*Hippophaë rhamnoides* L.) la altitudine mai mare decit limita sa naturală de vegetaţie. [**Growing *H. rhamnoides* at an altitude much above its natural limit.**] *Rev. Pădurilor* 1958 (4), (201–2). 3 refs. [Rum.russ.g.f.e.]

Gives the results of successful planting for soil protection at altitudes of ⩾ 1100 m.

235. SERGEEV, L. I., and SERGEEVA, K. A. Osobennosti godičnogo cikla i morozovynoslivost' drevesnyh rastenij. [**Characters of the annual cycle and frost hardiness of woody plants.**] *Dokl. Akad. Nauk SSSR* 119 (4), 1958 (823–5). 8 refs. [Russ.] A.P.B.

Gives a brief report on studies of the variations during the growing season of leaf water content and water-retaining capacity (as judged by the water content after [air?] drying for 30 hours), respiration and shoot growth, of 8 species in the Botanical Garden at Ufa, Bashkiria, including the frost-hardy *Tilia cordata*, *Prunus padus*, *P. maackii* and *Phellodendron amurense*, and also *Prunus fruticosa*, which is not hardy in Bashkiria. Whereas in frost-hardy plants shoot growth begins and ends earlier, in non-hardy species it sometimes extends to late July. The former have a lower leaf respiration rate, particularly in the first half of the growing season, and their water-retaining capacity increases during the growing season and is related to the content of hydrophilic colloids, while in non-hardy plants water-retaining capacity decreases during the second half of the season.

236. TRANQUILLINI, W., and HOLZER, K. Über das Gefrieren und Auftauen von Coniferennadeln. **[Freezing and thawing of conifer needles.]** *Ber. dtsch. bot. Ges.* 71 (3), 1958 (143–56). 22 refs. [G.g.] O.B.D.

Pinus cembra needles from the Alpine forest limit (2100 m. alt.) begin to freeze at −5° C. in March, −4° in April, and −2° in May. If the temperature does not sink below these respective levels, a certain amount of ice is formed within the needles, which, after a few hours, remains constant. If the temperature falls lower, ice is formed in successive stages. At −8° (March) or −6° (May) ca. 50% of the total water content is frozen. Further drops in temperature or a continuation of the cold do not increase this ice content. The frost resistance of *P. cembra* is probably due to the existence of a certain amount of water ('bound water') in the needles in a form that cannot freeze. Ice contents at temperatures that kill the tree were not investigated. Thawing requires some time, and begins within the same temperature range as the onset of freezing. If the temperature does not rise outside this range, only part of the frozen water thaws. With increased drying of the needles the maximum possible ice content drops, since the proportion of 'bound' water remains the same. With high water loss, and a rise in osmotic values, the range of freezing temperatures is lowered. This is the cause of the seasonal shift in needle freezing temperatures. Respiration does not cease until all 'free' water is frozen, but it has yet to be proved that there is a causal relationship between respiration and freezing. In the open, in winter, the lowering of the freezing point postpones the formation of ice in the needles, so long as the cold is not intense; respiration also is maintained for a longer period, and frost injury is less frequent than if the freezing-point were at 0° C. On cold, sunny days, however, needle temperature may fluctuate speedily, causing rapid freezing and thawing and consequent injury. [Cf. *F.A.* 20 No. 110.]

237. TRANQUILLINI, W. Frosthärte der Zirbe unter besonderer Berücksichtigung autochthoner und aus Forstgärten stammender Jungpflanzen. **[The frost-hardiness of *Pinus cembra*, especially of naturally regenerated plants and young stock from nurseries.]** *Forstwiss. Cbl.* 77 (3/4), 1958 (89–105). 31 refs. [G.g.]

[Cf. *F.A* 19 No. 1352.] In 1954–55 and 1955–56 investigations were made on the frost-hardiness of shoots and young plants of *Pinus cembra* (*a*) naturally regenerated at ca. 2000 m. alt. in the Guglertal, and (*b*) grown from seeds (provenances 1800–1900 m. alt.) in a nursery at 1400 m. alt. Some of (*b*) were transplanted to the 2000 m. alt. afforestation sites in Oct. 1955. Samples of branches and plants were subjected to slow cooling (min. temperature −34° C.) under laboratory conditions, and the degree of frost-hardiness calculated by the temperature at which at least 10% of the needles were clearly damaged. It was found that needles covered with snow in winter could withstand less frost than those above the snow, the difference in resistance being 6–10°. No definite conclusions could be reached on differences in the frost-hardiness of *P. cembra* needles of adult and young trees, though the former may be more resistant. Transplants from the nursery were considerably more sensitive to frost than were the naturally regenerated ones on the same site, the difference in resistance being 12°. Reasons for this were the climatic change, and also the nutrient conditions, the probably unbalanced N fertilizing in the nursery having an adverse effect. For afforestation of sites threatened by cold it is recommended to use stock from nurseries of high altitude, and to carry out better fertilizing in them, or to practise direct sowing of *P. cembra* on the afforestation site.

181.3. Water, Soil and Root Relations

See also No. 225.

181.31. Water Relations

See also Nos. 67, 104, 106–8, 235–6, 273–4, 814.

238. KOZLOWSKI, T. T. **Water relations and growth of trees.** *J. For.* 56 (7), 1958 (498–502). 53 refs.

A review of literature (mainly N. American).

239. WAISEL, Y. **Dew absorption by plants of arid zones.** *Bull. Res. Coun. Israel, Sect. D* 6 (3), 1958 (180–6). 14 refs.

[Cf. *F.A.* 19 No. 174.] An examination of 19 species from (*a*) Mediterranean and (*b*) desert flora, by the V-method (paired comparable secondaries forming a V, one branch protected from dew deposition) and measurements of water content and saturation deficit, showed the species to be either absorbers or non-absorbers, irrespective of origin in (*a*) or (*b*). Dew absorption was considerably higher on dry soils than under irrigation. The recorded amounts of dew absorbed seem of little value in balancing daily water output. *Olea europaea*, *Pinus halepensis*, *Ceratonia siliqua*, and *Pistacia lentiscus* were absorbers.

240. RUTTER, A. J., and SANDS, K. **The relation of leaf water deficit to soil moisture tension in *Pinus sylvestris* L. I. The effect of soil moisture on diurnal changes in water balance.** *New Phytol.* 57 (1), 1958 (50–65). 31 refs. O.R.S.

Two-year plants were potted in Dec. 1952 and in the following August 4 distinct soil moisture levels were obtained by watering, and measurements were made, during periods of 24 hours, of leaf water deficit (L, expressed as a % of water at turgidity), transpiration rate, stomatal opening, temperature and evaporation. Increase in soil moisture tension caused a progressive increase in L and a decrease in transpiration and stomatal opening (both in the number of open stomata and the period of opening during the day). L, transpiration, and stomatal opening, although they all reflected variations in soil water suction, were affected by other factors obscuring the direct effect. In the case of L, an equilibrium between plant and soil is attained before sunrise and, if measured in the morning before the onset of stomatal transpiration, L appears to be closely related to soil moisture conditions. The

persistence of appreciable deficits in wet soil indicates that factors other than physical soil moisture tension oppose water uptake.

241. KALOYEREAS, S. A. **A new method of determining drought resistance.** *Plant Physiol.* 33 (3), 1958 (232–3). 10 refs. O.R.E.

Describes a laboratory test based on the heat stability of chlorophyll *in situ*, which gave good correlations with known drought resistance of some *Pinus taeda* strains from Texas. It appeared more reliable than tests for bound water or –SH groups. *From author's summary.*

181.32/.34. Soil and Nutrient Relations

See also Nos. 20–1, 32–43, 46–7, 51–2, 99, 257, 267, 311, 420–6, 650.

242. HINSON, W. H. **[The study of nutrition of forest species.]** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (62).

It seems likely that controlled sand (or water) culture methods should yield information on the nutrition of forest species not obtainable by other techniques. To gain some practical experience in this field, a sand culture of *Populus* × *gelrica* is being maintained to demonstrate major nutrient-deficiency symptoms. The relative growth rates show the overriding importance of a high level of N, and suggest that Poplar cuttings are unlikely to respond to dressings of P or K except under extreme conditions; a Mg deficiency characterized by intervenal chlorosis, and in the later stages by a loss of rigidity in the wood, may be readily induced by application of K.

243. HARADA, H. **[Effects of soil nutrient levels on the growth and nutrient uptake by forest seedlings. (I) Effects of soil phosphorus levels on the growth of Sugi (*Cryptomeria japonica* D. Don) and Karamatsu (*Larix kaempferi* Sarg.) seedlings.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 103, 1957 (69–82 + 1 plate). 16 refs. [Jap.jap.e.*e.*]

Pots with 7·5 kg. of soil poor in P were each fertilized with 15, 5 and 3 g. respectively of CaO, $(NH_4)_2SO_4$, and K_2SO_4 and with 0, 3, 6, 10, 15 or 20 g. of P, sown or planted with (*a*) Sugi or (*b*) Larch, and the plants analysed after one growing season in the open as 1 + 0 seedlings and 1 + 1 transplants. The concentrations (% of dry matter) and the absolute amounts of N, P, K and Ca in the various parts of the plants are tabulated. Growth was worst for both species at P_0 and best for seedlings of (*a*), transplants of (*a*), and both types of (*b*) at P_{15}, P_{10}, and P_{20} respectively, indicating a greater response to soil P in Larch. Concentrations of P in the top growth increased with soil P as also did those in the roots except in the seedlings of both species at P_{20} and in the (*a*) transplants at all P dosages. Absolute content of P in all parts of the plants was closely related to soil P but the P content (and concentrations) of the tops of (*a*) and the roots of (*b*) were higher than in the corresponding parts of the other species. Concentrations of N in the top growth of (*a*) and (*b*) transplants, of K in the (*a*) seedlings, and Ca in the (*a*) transplants and (*b*) seedlings and transplants were related to soil P. It seems that nutrient concentration may increase with increasing soil P (nutrient uptake > growth), reach a peak and decline (growth > uptake). The absolute amounts of N, K and Ca in the top growth was related to soil P except in the (*a*) transplants at P_{15} and P_{20}. Excessive application of P in poor soils (particularly those lacking in N and Ca) may induce nutrient deficiency.

244. KURAMOTO, M., YAMAMOTO, T., and NAGAOKE, T. **[Studies on proper site for Todo-Fir [*Abies mayriana*] in Hokkaido. IX. Soil survey in an artificial forest of Todo in good growth. I.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 8, 1957 (55–63). [Jap.jap.e.*e.*]

Gives a location map for good stands throughout Hokkaido, and the chemical and mechanical analyses of the soils, with climatic data and a geological map. The good Esashi Fir stands are on volcanic ash and andesite or sandstone, shale and chert; on clayish loams of nutty structure; wettish, with high but freely moving ground-water.

245. STEPHENS, C. G., and BOND, R. D. **Nitrogen economy in plantations of *Pinus radiata*.** *Aust. For.* 21 (2), 1957 (117–9). 6 refs.

P. radiata in 3 different stands in S. Australia (1 unthinned, and 2 thinned) and the soil profiles below them, were sampled for N content, and the results are presented on a per-acre basis. In the unthinned stand, total N in the aerial parts of the tree and in the litter were ca. ¾ the N content of the A horizon. In the thinned stands the proportion was lower. It is calculated that a considerable conservation of N (up to 80%) would follow any procedure that avoided the use of fire between successive crops of trees.

246. TILLER, K. G. **Some Pine-soil relationships in the Mt. Burr forest area, South Australia.** *Aust. For.* 21 (2), 1957 (97–103). 3 refs.

Studies on the trace-element content of selected needles from *Pinus radiata* and associated soils showed that the tree roots have access to the basaltic soils buried beneath the podzolized aeolian sands of some areas in the Mt. Burr forest. The influence of these buried soils in the nutrition of the Pine is discussed. Circulation of material by the Pines has not greatly affected the nutrient status of the surface soil for the elements studied. No general relationship could be found between the trace-element content of the Pine needles, the soil, or the health of the Pines. Zn content was highest in the needles from the healthiest Pines and in the soils below these Pines, and lowest in the soil beneath the poorest Pines. Results of analyses also suggested that in the early stages of needle decay, Cu and Zn were readily leached from the needles and that Ni, Mn, Mo and V tended to be retained. *From author's summary.*

247. BLOKHUIS, J. L. W. De groei van de Japanse lariks en de fosforbehoefte. **[The growth of Japanese Larch and its P requirements.]** *Ned. Bosb. Tijdschr.* 30 (8), 1958 (235–40). 7 refs. [Du.]

Discusses Dutch literature on P requirements and concludes, from a study of shoot growth on sites

with different P values, that there is no correlation between growth and content of P in the soil.

181.35. Special Modes of Nutrition. Symbiotic Relationships. Parasitism

See also Nos. 411, 419.

248. BOND, G., GARDNER, I., and LEAF, G. **The distribution of ^{15}N fixed by root nodules of *Alnus glutinosa*.** *Abstr.* in *Biochem. J.* 69 (1), 1958 (3 *P*). O.R.S.

In extracts of nodules exposed to $^{15}N_2$, the highest atom % of ^{15}N was found in glutamic acid and the next in citrulline or aspartic acid. NH_3 contained less again and arginine very little. When citrulline was degraded to NH_3 and ornithine, the ammonia liberated was richer in ^{15}N than was glutamic acid. The significance of these findings will be discussed.

249. QUISPEL, A. **Symbiotic nitrogen fixation in non-leguminous plants. IV. The influence of some environmental conditions on different phases of the nodulation process in *Alnus glutinosa*.** *Acta bot. neerland.* 7(2), 1958 (191–204). 16 refs. [E.e.] O.B.D.

[Cf. *F.A.* 17 No. 2551.] The following conclusions were drawn from experiments with greenhouse cultures given 3000 luxes from fluorescent lamps from 8 a.m. to 8 p.m. during the winter: (1) The number of nodules depends on the light conditions and the presence of nitrates during, or shortly before, the inoculation period, but even after this period these environmental factors may inhibit the formation of nodules. (2) The growth of the nodules especially depends on the environmental conditions (light, nitrate) after infection has occurred. (3) The absence of KH_2PO_4 in the nutrient solution has no effect during or before inoculation, but inhibits nodule formation during the week immediately following the inoculation period. The absence of phosphate during the later weeks does not influence either the number of nodules or their growth. (4) It is suggested that the number of nodules depends not only upon the infection of preformed foci but also upon a subsequent phase of nodule initiation during which it is decided which of the infected foci will develop into nodules. At present nothing definite is known about this phase of nodule initiation.

250. BOND, G.; MONTSERRAT, P. **Root nodules of *Coriaria*.** *Nature, Lond.* 182 (4633), 1958 (474–5). 6 refs.

The shrubby genus *Coriaria* is one of the 8 non-legume angiosperm genera known to have the capacity to form root nodules in response to infection from the soil by a symbiotic organism. So far, however, only in Japan has evidence been found of N-fixation by the root nodules of *Coriaria* spp. The first author of the present communication has now received information from New Zealand of the occurrence of nodulation in that country also. European species of *Coriaria* have not hitherto been examined for the occurrence of root nodules, but the second author now reports finding root nodules on young plants of *C. myrtifolia*, which is abundant in the less dense woodlands of Gerona and Barcelona provinces.

251. BOULLARD, B. Progrès récents dans l'étude des mycorhizes ectotrophes. **[Recent progress in the study of ectotrophic mycorrhizae.]** *Bull. Soc. bot. France* 105 (1/2), 1958 (60–93). 241 refs. [F.] O.B.D.

A review of world literature from 1896 to the present day.

252. CLODE, J. J. E. As micorrizas na migração do fósforo—estudo com o ^{32}P. **[The rôle of mycorrhizae in the translocation of P—a study using P^{32}.]** *Publ. Serv. flor. aqüic. Portugal* 23 (2), 1956 (167–206 + 4 plates). 54 refs. [Port.port.e.]

The distribution of P was observed in 4 classes of 10-month-old *Pinus radiata*: (1) without either mycorrhizae or phosphate fertilizer, (2) with mycorrhizae but no phosphate fertilizer, (3) without mycorrhizae and with phosphate fertilizer, and (4) with mycorrhizae and with phosphate fertilizer. Whereas (2) gave greater growth than (1), (3) gave greater growth than (4). It seems, therefore, that mycorrhizae present a special problem with regard to P nutrition. In plants without mycorrhizae there was a greater quantity of P in the aerial parts than the roots, whereas in plants with mycorrhizae this was reversed. The mycorrhizal plants took up a greater total quantity of P than the non-mycorrhizal plants. In mycorrhizal roots the concentration of P was higher in the fungus than in the adjoining tissues of the host, being highest of all in the fungal sheath.

253. PRYOR, L. D. **How important is mycorrhiza to introduced conifers?** *Aust. J. Sci.* 20 (7), 1958 (215–6). 3 refs. O.R.S.

Norway Spruce seedlings grown in pots in soil to which mycorrhizal material had been added, developed characteristic mycorrhizal rootlets and were larger and healthier after two growing seasons than untreated ones. Further research on introduced conifers is recommended.

254. MAŃKA, K., and TRUSZKOWSKA, W. Próba mykologicznej analizy korzeni świerka (*Picea excelsa* Lk.). **[Mycological investigation of roots of *P. abies*.]** *Acta Soc. Bot. Polon.* 27 (1), 1958 (45–73). 21 refs. [Pol.g.] O.B.D.

Root specimens were examined in order to investigate the fungi coming in contact with them. The specimens were of 5 types: (1) mycorrhizal roots, (2) roots up to 0·5 mm. thick, (3) 0·5–1 mm. thick, (4) 1–3 mm. thick and (5) > 3 mm. thick. They were cultured on 3 different types of agar nutrient medium, and part of the root was also investigated anatomically. The most fungi were isolated from (1), (2), and (3), the number declining as root thickness increased. Fungi were found in anatomical contact with non-mycorrhizal as well as mycorrhizal roots, but less frequently as root thickness increased. Species associations of fungi varied according to the type of material. Altogether 41 species and forms were isolated, the species most frequently isolated being an unidentified non-fruiting fungus. Two new species are provisionally reported: *Absidia sphaerosporangioides* and *Hormodendron microsporoides*. *From authors' summary.*

255. LEVISOHN, I. **Researches on mycorrhiza.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (86–91).

Effects of a given mycelium in different soil environments: In pot cultures of Birch seedlings growing in different soils, it was observed that *Boletus scaber* stimulated growth of the Birch in Wareham soils but depressed it in soils from Wykeham Moor, Yorks. It is suggested that mycorrhiza-formation and fairly good development of Birch in uninoculated Wykeham Moor soil may be due to *Boletus carpini* (known to occur in the area from which the experimental soil was obtained) and not to *B. scaber*, which may possibly be antagonistic to it. [Cf. *F.A.* 19 No. 179]. *Effects of different mycelia in the same soil environment*: Inoculation of Wareham soils with *Boletus scaber* and with *Amanita muscaria*, before sowing with Birch and Norway Spruce, demonstrated that seedlings of both species formed mycorrhizae and benefited in growth in the presence of *B. scaber* but were unaffected by *A. muscaria*. Scots Pine seedlings grown in sand cultures inoculated with *B. bovinus* averaged 2·9 in. at 1 year compared with 1·9 in. for uninoculated controls and for those grown in soils inoculated with *B. scaber*. *Influence of mulching on tree growth and root infection*: A number of mulching experiments have been carried out over a long period in various parts of the Wareham area, and the results are now summarized as follows. On acid soils, mulching of checked trees produces beneficial effects on tree development, associated with changes in quantity and/or quality of certain common root infections. These changes involve: (1) increase in mycorrhizal infection when initially present in the plants, or induction of mycorrhizal associations by mycelia present in the mulched soil; (2) disappearance of pseudomycorrhizal infection with replacement by mycorrhizae; (3) development of a heavy investment of mycorrhizal mycelia round the roots. Further experiments with pot cultures leave the question still open as to whether root infections of mulched plants are the cause or the result of better tree growth.

256. LEVISOHN, I. **Mycorrhizal infection in *Eucalyptus*.** *Emp. For. Rev.* 37 (2), 1958 (237–41). 2 refs.

The root material was studied of 23 *Eucalyptus* species from the U.K., Australia, Ceylon, Israel, Italy, Kenya and Morocco. Mycorrhizal infection was found in 8 of the 12 species belonging to the *Macrantherae* group and 6 of the 11 in the *Renantherae* group. A table shows the presence, absence, and degree of infection according to species, place of origin and age of trees. A case of mycorrhiza formation by a *Scleroderma* species on *E. gomphocephala* in Israel is described. Observations and preliminary data from pot-culture experiments have so far yielded no conclusive evidence on the degree of dependence of these groups on mycorrhizal infection. [Cf. *F.A.* 18 No. 1377.]

181.36. Root Relations and Root Development etc.

See also Nos. 116, 150.

257. OKSBJERG, E. B. **Investigations of the distribution of roots and root competition for phosphate in stands of *Picea excelsa* and *Abies alba*.** *Oikos* 9 (1), 1958 (57–76). 14 refs. [E.]

P^{32} was supplied to the soil of a stand, partly in superficial fields having an area of 25 × 25 cm., and partly by leading through glass tubes to fossil humus layers, and an attempt was made to measure the P absorption by successive determinations of radioactivity in the crowns of the trees. The absorption of P from fossil humus layers was slight both for *Picea abies* and *Abies alba*, and for *A. alba* the absorption of P from the superficial mor layer was also very small. *P. abies*, however, absorbs measurable quantities from superficial P sources. Distribution of activity in the crown is very irregular; but in the same branch specific activity is rather constant (falling slightly) from younger to older annual shoots. Activity is highest in the uppermost, well exposed whorls of branches. The measurements throw light on the qualitative question, whether the P-enriched small field of the superficial humus layer of the conifers is common to the root systems of many trees, but does not allow a quantitative description of the competition of individuals for the P content of the fields. The measurements show that the P absorption of a tree decreases with increasing distance from the source, but no distinctly regular dependence can be inferred. This may be due to many factors, in addition the considerable uncertainty of the method generally. *From author's summary.*

258. DOMANSKAJA, N. P. Formirovanie kornevoj sistemy čereščatogo duba. **[Formation of the root system of *Q. robur*.]** *Dokl. Akad. Nauk SSSR* 119 (6), 1958 (1233–5). 3 refs. [Russ.] A.P.B.

An analysis is made of the ontogeny of the root system of *Q. robur* based on observations near Stalingrad. The author argues that a division of roots into long extension roots and short absorbing roots is not sufficient, as in Oak there exists a third group, intermediate in both function and structure. These are capable both of absorbing and of conducting water and solutes, and they show some secondary growth. Three periods of root development are distinguished. After germination, the seedling has a main root on which are distributed only absorbing and intermediate roots. With the appearance of the long roots engaged in extension growth, the main root becomes less important and often dies. Finally, in mature trees, the long and the absorbing roots of higher order die, bringing about dieback of the crown. New roots appear near the root collar and function for up to 4 years; with their death, the tree also dies.

259. AHLGREN, C. E. **Adventitious roots and shoots of wilding White Pine [*Pinus strobus*] at the Quetico-Superior Wilderness Research Center.** *Minn. For. Note* No. 70, 1958. pp. 2. 2 refs.

Observations on the occurrence of roots at 1·5–3 in., and shoots at 4–6 in., above the root collar. The trees (ca. 9 years old) were growing on a good White Pine site under a well stocked, mature stand, and had been treated by various forms of bark disturbance (inversion of whole or partial rings, removal and replacement of rings). The production

of adventitious shoots was apparently stimulated by bark disturbance, but adventitious roots appeared equally on untreated controls.

260. NEUBAUER, H. F. Über zwei Fälle ungewöhnlicher Wurzelbildung aus dem Stamme. **[Two cases of unusual root formation from stems.]** *Angew. Bot.* 32 (3), 1958 (111–4). [G.] E.M.B.

On the slopes of the extinct volcano Gunung Selamat, in central Java, an *Agathis alba* was found that had formed adventitious roots up to a height of ca. 2½ m. on the stem where the bark had sustained injuries. In a cultivated Cherry growing near Vienna, the adventitious roots were formed where decay had attacked the stem through a pruning wound.

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See also Nos. 98; 257, 281.

261. **[Fire resistance of Slash Pines.]** *Rep. For. Dep. Fiji 1957*, [1958] (7).

Pinus caribaea gave almost 100% survival, *P. elliottii* only 75%, after an intense grass fire. *P. caribaea* has grown well on all sites, and exceptionally well in reed (*Miscanthus japonicus*) near sea level —15 ft. in 12 months.

181.5. Reproductive Behaviour

See also Nos. 123–8, 131, 138, 186, 225, 348 *et seq.*

262. GARIN, G. I. **Longleaf Pines can form vigorous sprouts.** *J. For.* 56 (6), 1958 (430–1). 1 ref.

Five-year-old *Pinus palustris* in Alabama were cut at ground level with an axe. Six months later all the stumps that had all or part of the root collar left, had produced vigorous shoots with dense foliage. [Cf. *F.A.* 16 No. 234.]

263. WAREING, P. F., and LONGMAN, K. A. **Studies on the physiology of flowering in forest trees.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (106–7).

An attempt is being made to elucidate the physiology of flowering, with particular reference to the possibility of hastening the onset of flowering as an aid to forest tree breeding. Evidence has been obtained that the position of the shoot in relation to gravity is important for flower-bud formation in Larch: ♂ flower buds are found predominantly on the underside of horizontal twigs, and on all sides of trailing ones. Experiments are now being made with shoots of Larch in various positions, to determine whether flowering can be induced by appropriate geotropic treatment. Attempts are also being made to reduce the duration of the juvenile phase by photoperiodic treatment of young trees. [Cf. *F.A.* 20 No. 128.]

264. NIENSTAEDT, H. **Receptivity of female strobili of White Spruce.** *For. Sci.* 4 (2), 1958 (110–5). 6 refs.

The cones of 6 *Picea glauca* were receptive for 3–5 days, fairly well synchronized over each tree, but with some variation between trees. Pollen shedding coincided fairly well with receptivity, an advantage in controlled pollinations. Weather at pollination time and insect pests [cf. *F.A.* 18 No. 3062] are the important limiting factors for the natural seed crop.

265. TJURIN, A. V. Hod zacvetanija duba *Quercus robur* L. v lesah evropejskom časti SSSR (s 1948 po 1954 g.). **[The flowering time of *Q. robur* in the forests of the European part of the U.S.S.R. (1948–1954).]** *Bot. Ž.* 43 (2), 1958 (246–9). 6 refs. [Russ.]

In continuation of a study noticed previously [see *F.A.* 16 No. 2780] on the early-flushing form of *Q. robur*, the author tabulates the observed flowering dates over all or part of the period for 20 different localities, and discusses the accuracy of isolines of probable flowering dates derived from these records. [Cf. *F.A.* 18 No. 218.]

266. TUZ, A. S. Anomal'noe cvetenie i plodonošenie greckogo oreha. **[Anomalous flowering and fruiting of *Juglans regia*.]** *Priroda, Moskva* 47 (5), 1958 (91–2). [Russ.] A.P.B.

Describes a specimen of *Juglans regia* ca. 6 m. high at Karakum, Fergana province, that flowers in May/June, i.e. 30–40 days later than usual, and might be useful in breeding of late-flowering forms with a view to wider cultivation of this species. On this plant the fruit was on shoots of the lowest buds, formed the previous year.

267. WAISEL, Y. **Germination behaviour of some halophytes.** *Bull. Res. Coun. Israel, Sect.D* 6 (3), 1958 (187–8). 11 refs.

Investigations for a possible correlation between salt tolerance in germination and salinity of habitat in 16 of the most common local halophytes under various concentrations of NaCl (and some of $CaCl_2$) at 20 and 30° C., in the dark or in continuous light, showed a correlation for 8 species but not for the 8 *Tamarix* species included.

268. STEARNS, F., and OLSON, J. **Interactions of photoperiod and temperature affecting seed germination in *Tsuga canadensis*.** *Amer. J. Bot.* 45 (1), 1958 (53–8). 23 refs. O.B.D.

Germination tests of *T. canadensis* from 5 widely scattered seed sources under varying photoperiod and temperature conditions showed that germination varies widely with both these factors. Temperature modifies the most favourable photoperiod. Rapid germination of excised embryos, unaffected by photoperiod or temperature, suggests that the endosperm (megagametophyte) or nucellus is important in seed inhibition. Moist chilling (stratification) for 10 or more weeks hastens germination and eliminates most light/temperature effects. As compared with northern (Quebec and Maine) seed, southern (especially Tennessee) seed, given favourable photoperiods, shows less need for chilling; given stratification it has higher optimum germination temperatures. Such genetic differences in seed physiology support the evidence of diverse ecotypes adapted to climatic contrasts within the range of widespread native species. *From authors' summary.*

269. ASAKAWA, S. **Studies in the delayed germination of *Fraxinus mandshurica* var.**

japonica **seeds. (7) Thermoperiodicity in germination.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 103, 1957 (25–44). 16 refs. [Jap.E.jap.e.]

[Cf. *F.A.* 18 No. 3801; 19 No. 330; 20 No. 404.] Using seed stratified at 25° C. for 3 months and then 2° for 2 or 4 months, highest germination % was obtained under alternations of 25° and 8° for 8–4 hr. and 16–20 hr. in the 24-hr. day or for longer cycles in the same proportion. These alternations had an effect even in anaerobic conditions, thereby eliminating increased aerobic respiration as a first essential effect. Summarizing the information to date, dormancy is broken down by (*a*) warm and (*b*) subsequent cold stratification. During (*a*) the embryo becomes non-dormant, during (*b*) it gets greater growing pressure and the inhibiting activity of the seed's mucilaginous layer and endosperm disappears. With growing pressure the 'thermoperiodic phase' is entered during which alternations of temperature abruptly raise the pressure, which bursts the suberized membrane and the seed germinates. If, however, the (*b*) period is lengthened, pressure can be raised sufficiently to break the membrane and the seed germinates (under a higher temperature) rather more quickly than with alternations of temperature. It has entered a 'non-thermoperiodic phase'. The pericarp appears to have some inhibiting effect on at least one of the (*a*) and (*b*) stages. Some information on the metabolic pattern is given. The balance of the metabolic phases during germination in an alternating temperature regime is probably different, as water absorption increases with lower and decreases with higher temperatures.

270. GROSE, R. J., and ZIMMER, W. J. **Preliminary laboratory studies on light requirements for the germination of some Eucalypt seeds.** *Aust. For.* 21 (2), 1957 (76–80). 1 ref.

Tests for light requirements were carried out on (1) single seed samples of 16 different species, and (2) five or more collections of 6 additional species from different localities in the state of Victoria. In some species most of the seed samples needed a certain amount of light for satisfactory germination, e.g. *Eucalyptus largiflorens*. In others, e.g. *E. leucoxylon*, occasional seed samples required light, while the majority did not. In yet others, e.g. *E. macrorrhyncha*, all seed samples germinated equally well in darkness or light. For some seed samples, e.g. of *E. dives* and *E. sideroxylon*, continuous light was less suitable for germination than continuous darkness, and for others, e.g. *E. largiflorens*, continuous light was less suitable than inclusion of a 2-hour dark period. In some light-demanding seeds, absence of light had a greater inhibitory effect when they were germinated at temperatures far removed from the optimum.

271. PIVNIK, S. A. O vnutrividovyh vzaimootnošenijah podrosta kedrovogo stlanika (*Pinus pumila* [Pall.] Rgl.). **[The intra-specific relationships of regeneration of *P. pumila*.]** *Bot. Ž.* 43 (3), 1958 (433–6). 6 refs. [Russ.]

Discusses observations on the growth of seedlings of *P. pumila* (the seeds of which are 'sown' in groups by *Nucifraga caryocatactes*) in nest sowings and natural regeneration in several different forest associations in Yakutsk. Examines root formation, height growth, and the influence on growth of the original number of plants per group. In very early youth, seedlings in groups do better than isolated seedlings, but competition also begins early and the group structure tends to disappear with age as the suppressed seedlings die. In most of the associations examined, group regeneration formed ⩾20–30% of the total regeneration.

272. PLAISANCE, G. Influence de la lumière sur les semis de chêne (les facteurs favorables). **[Influence of light on Oak seedlings (favourable factors).]** *Annales scientifiques de l'Université de Besançon* (*2me Série, Botanique*) 9, 1957 (171–81). 6 refs. [F.f.e.] O.B.D.

Results are presented of tests of the growth of *Quercus robur* and *Q. sessiliflora* in the forest and during the first growing season under 2, 15, 50% and full, and of *Q. borealis* under 30, 50 and full illumination. The light requirements of competing vegetation are also discussed, along with the effects on regeneration of opening the canopy. In general, for *Q. robur* and *Q. sessiliflora* it seems unnecessary to give more than 50% and for *Q. borealis* 15–30% of full illumination.

273. HOSNER, J. F. **The effects of complete inundation upon seedlings of six bottomland tree species.** *Ecology* 39 (2), 1958 (371–3). 5 refs.

This study in Illinois suggests that floods in bottomland hardwood areas during the growing season exercise a selective effect upon the species of tree seedlings surviving. Only *Salix nigra* seedlings can survive ⩾ 32 days of complete inundation; many *Fraxinus pennsylvanica*, some *Liquidambar styraciflua*, and possibly a few *Acer negundo* can survive 16 days, *Populus deltoides* and *Acer saccharinum* only < 16 days. The rate of recovery of surviving trees also varies. In general the Willow and Ash recovered quickly, whereas the others showed the effects of submergence for longer.

274. **[Effect of flooding on survival and growth of Yellow Poplar seedlings.]** *Rep. Stheast. For. Exp. Sta. 1957*, 1957 (8).

When tanks containing ca. 20 seedlings each were flooded in January and May for 1 to 14 days, the January flooding had no effect. In May, 50% were killed after 4 days, and 95% after 14 days' submersion. Height growth declined sharply after 3 days of flooding. Flooding in June, when the plants were 1 foot above the surface, had similar effects.

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 127–8.

275. CATRINA, I., and MOISIUC, G. Caracterele creşterii păducelului şi lemnului cîinesc în două staţiuni diferite. **[Growth characteristics of Hawthorn [*Crataegus monogyna*] and Privet [*Ligustrum vulgare*] in two different habitats.]** *Rev. Pădurilor* 1958 (4), (202–4). 2 refs. [Rum.]

Comparison of the two species grown (*a*) under forest canopy, (*b*) on the steppe, showed much greater root, shoot, and leaf growth for both species on (*b*). Sp. gr. of wood differed in Privet only in root wood (0·5 and 0·43 g./c.c. for (*b*) and (*a*) respectively); in Hawthorn the sp. gr. of root wood differed similarly but there was also a difference in stem wood—0·5 for (*b*) and 0·67 for (*a*).

181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

276. JOVANČEVIĆ, M. J. Medunac u Trstenu i okolišu. [***Quercus pubescens* in Trsteno and its environs.**] *Šum. List* 82 (5/6), 1958 (186–93). 5 refs. [Serb.e.]

Describes a giant specimen of *Q. pubescens* (d.b.h. 185 cm.) in the arboretum at Trsteno, S. Dalmatia. Notes are given on the ecology of the site and the climate of the area. It is considered that attempts to cultivate *Q. pubescens* in S. Dalmatia should only be made on fertile and moist sites.

277. BHADRAN, C. A. R. **Giant trees of India.** *Indian For.* 84 (6), 1958 (318–33).

Records of 171 outstandingly large and old trees.

181.8. Phenology

See Nos. 28, 34, 96, 109–10, 112, 120–2, 131, 139, 149, 235, 265–6, 646, 777, 951–2.

182. Synecology, Plant Sociology: General, Principles and Methods

182.1. Palaeoecology. History of Vegetation. Pollen Analysis

See also Nos. 137, 139.

278. AXELROD, D. I. **Evolution of the Madro-Tertiary Geoflora.** *Bot. Rev.* 24 (7), 1958 (433–509). 86 refs.

Reviews the composition, early evolution and post-Eocene history in the far west of the U.S.A., of this flora which developed in the S.W. of N. America in a dry zone between the Arcto-Tertiary and Neotropical-Tertiary floras, and which comprises semi-arid Live-Oak/conifer woodland, chaparral, arid subtropical scrub, plains (desert) grassland, and subdesert to desert vegetation.

279. GOOD, R. **The biogeography of Australia.** *Nature, Lond.* 181 (4626), 1958 (1763–5). 2 refs.

Sets out the hypothesis that the land mass of Australia originated in the neighbourhood of S. Africa and has drifted N.E. to its present proximity to New Guinea, and discusses the botanical and ecological evidence for this. On this theory, the temperate rain forest in Tasmania and the adjacent mainland is a survival, and the tropical rain forest of the north a relatively recent development borrowed from Melanesian sources. The lack of a desert flora is taken to be due to the separation from Africa before the evolution of desert flora there, and the typical Australian types (*Casuarina* and Myrtaceae, especially the Eucalypts) also to have been developed relatively recently from Melanesian tropical flora.

182.2. Succession, Alternation and Periodicity in Vegetation

280. OLSON, J. S. **Rates of succession and soil changes on southern Lake Michigan sand dunes.** *Bot. Gaz.* 119 (3), 1958 (125–70). 64 refs. O.B.D.

Traces the development from dune grasses to Pine (*Pinus banksiana* or *P. strobus*) and *Quercus velutina*, and, on moister sites, the succession *Tilia americana—Quercus borealis—Acer saccharum.*

281. DANSEREAU, P. Effets des parasites sur les structures de végétation. **[The influence of parasites on the structure of vegetation.]** *Rep. Quebec Soc. Prot. Pl. 1957*, 1958 (24–39). 22 refs. [F.]

Discusses the effect on stand structure of epidemic diseases or severe insect attacks, with illustrations from sea-shore, swamp, and forest vegetation (e.g. the substitution of low Birch for high Spruce/Fir forest, following attacks by Spruce budworm, and low Sassafras for high Oak/Chestnut following the elimination of Chestnut by *Endothia parasitica*).

282. CLAYTON, W. D. **Secondary vegetation and the transition to savannah near Ibadan, Nigeria.** *J. Ecol.* 46 (2), 1958 (217–38 + 1 plate). 31 refs.

Successional trends in relation to land use were studied on a small area of heavily farmed land in the lowland rain forest of Nigeria. The vegetation complexes of the 3 main soil types, i.e. clayey, sandy, and poorly drained swampy soils, are discussed. The general trend is that of a gradual degradation of secondary forest towards savanna.

182.3. Units of Vegetation (Associations etc.: Theory)

See No. 306.

182.4. Layer Communities

283. SAWARAGI, S. **The epiphytic bryophyte community on *Pinus densiflora* Sieb. et Zucc.** *Japanese Journal of Ecology* 7 (3), 1957 (115–7). [Jap.e.] From *abstr.* in *Biol. Abstr.* 32 (6), 1958 (No. 18620).

284. CRANDALL, D. L. **Ground vegetation patterns of the Spruce-Fir area of the Great Smoky Mountains National Park.** *Abstr. of thesis*, in *Dissert. Abstr.* 18 (4), 1958 (1228). O.R.S.

285. ELLISON, L., and HOUSTON, W. R. **Production of herbaceous vegetation in openings and under canopies of western Aspen [*Populus tremuloides*].** *Ecology* 39 (2), 1958 (337–45). 19 refs.

Heavier grazing by livestock in openings is believed to be responsible for the poorer production and species composition of the herbaceous vegetation commonly noted in openings than under the Aspen canopy.

182.5. Synecological Measurements and Methods

See Nos. 303, 891–2.

187. Vegetation Types

See also Nos. 4, 11–3, 49, 77–8, 112, 170, 278–82, 284, 321–33, 343, 468, 891–2, 1298, 1300.

286. HARTMANN, F. K. Über Waldgesellschaften der mitteleuropäischen Gebirgslagen. **[Forest communities of the mountain sites of central Europe.]** *Proc. 8th. int. bot. Congr. 1954, Sect. 7–8*, 1957 (54–7). [G.]

Presents in tabulated form the characteristics of recognized associations and sub-associations of montane and high montane sites.

287. KRISO, K. Entstehung, Aufbau und Leistung von Eichen-Hainbuchen-Beständen in Süddeutschland. **[The origin, structure and yield of Oak/Hornbeam stands in S. Germany.]** *Forstwiss. Forsch.* No. 9, 1958. pp. 78 + 4 plates. 74 refs. [G.g.]

Describes the methods of sampling and evaluation used in an examination of the sites, and the structure, composition, history and associated vegetation of 62 Oak/Hornbeam stands found in S. Germany usually at < 400 m. alt., and discusses the results in detail. Many different types of site carried the two species, and it is not considered possible to speak of a natural Oak/Hornbeam site in this area: ecologically there are connexions with forest communities of Beech, Birch etc. Many different forms of stand structure were found, usually influenced strongly by the past management of the stand. Several other tree species were represented, some improving, others impairing the stands. Considerable influence of man on stand composition was obvious, particularly in the removal or suppression of Beech, and, in several cases, in the probably artificial formation of stands. From these findings it is argued that the *Querceto-Carpinetum* is neither floristically, ecologically nor genetically uniform, and in many cases not even natural. The value of the stand depends mainly on the quality of the Oak present. Data on tree height, diam. and b.a. for some of the stands are discussed, and the Hornbeam is defended as being the silviculturally ideal associate for Oak, and as a potentially valuable timber tree in its own right. Individual specimens > 30 m. high and of d.b.h. up to 64 cm. were found.

288. KLÖCK, W. Regional- und Standortsgesellschaften der Fränkischen Platte. **[Regional forest plant communities and site communities on the Fränkische Platte.]** *Allg. Forstzeitschr.* 13 (28), 1958 (400–2). 5 refs. [G.g.]

Discusses the present composition of coppice-with-standards and transitional types with Oak predominating, and high forests developed therefrom with Beech predominating, and contends that a classification according to Schlenker [cf. *F.A.* 14 No. 939] into Oak/Beech, Beech/Oak mixed forest etc. would express the character of the natural forest types of the region better than the plant sociologist's *Querceto-Carpinetum*.

289. PASSARGE, H. Beobachtungen über Waldgesellschaften im Jungmoränengebiet um Flensburg und Schleswig. **[Forest associations in the recent moraine region about Flensburg and Schleswig.]** *Arch. Forstw.* 7 (4/5), 1958 (388–408). 21 refs. [G.g.russ.e.]

Presents, with climatic data, association tables of (1) *Deschampsia*-Beech forest (*Periclymeno-Fagetum*, boreo-atlantic vicariant); (2) *Melico-Fagetum balticum*, sub-atlantic vicariant; (3) *Fraxino-Fagetum balticum*; (4) fertile-slope Beech; (5) Alder/Ash; and (6) *Querco-roboris-Betuletum*, showing a remarkable similarity in mosaic and structure with the associations of the younger diluvial moraines of Mecklenburg, the divergent associations playing a merely vicarious rôle dependent on geographical and site conditions.

290. SCAMONI, A. Natürliche Waldgebiete der Deutschen Demokratischen Republik. **[Natural forest regions of E. Germany.]** *Arch. Forstw.* 7 (2), 1958 (89–104). 28 refs. [G.g.russ.e.]

Shows on a contour map (1 : 1,000,000) the distribution of 28 types and their variants, based on the natural vegetation (associations), describes them briefly and indicates their grouping by altitudinal zonation (plains, transition, foothills, montane and high montane); by climate (subatlantic, transitional, subcontinental, lee and windward montane); and by tree species (areas where Beech is scanty or wanting, where Beech and Sessile Oak grow at an equal rate, where Sessile Oak as a companion to Beech gradually yields place to Pedunculate Oak). Further work is required on growth-rate differences in the regions for species other than Scots Pine and Oak.

291. HOFMANN, G. Vegetationskundliche Untersuchungen an wärmeliebenden Gebüschen des Meininger Muschelkalkgebietes. **[Ecology of the thermophile scrub of the Meiningen shelly limestone region [S. Thuringia].]** *Arch. Forstw.* 7 (4/5), 1958 (370–87). 4 refs. [G.g.russ.e.]

Association tables are given for the secondary scrub socies (*a*) *Clematido-Coryletum*, (*b*) *Caprifolio-Cornetum*, (*c*) *Ligustro-Prunetum* and (*d*) *Junipero-Cotoneasteretum*, and their plant-geographical position is discussed to elucidate particularly the relations of the *Prunetalion* and *Berberidion* communities with their natural forest associations. The socies (*a*) and (*b*) are respectively pioneers of the fresh soil, and more moderate sites of the Orchid/Sycamore Maple/Beech forest (*Cephalanthero-Fagetum*); (*c*) of the grass/Hornbeam/Beech (*Carpino-Fagetum*); (*d*) of the *Sorbus torminalis*/Pine/Beech (*Antherico-Fagetum*). Recommendations for reforestation comprise: (1) Beech, (2) Hornbeam, (3) Sycamore Maple, (4) Ash, (5) *Tilia cordata*, (6) Field Maple, (7) Norway Maple, (8) Larch, (9) *Sorbus torminalis*, (10) *S. aria*, (11) *Prunus avium*, (12) Scots Pine, (13) Sessile Oak, (14) Douglas Fir, (15) Wild Pear: for (*a*) Nos. (1)–(8); for (*b*) (1)–(3), (5), (6), and (8)–(11); for (*c*) (2), (4) on limestone, (5), (6) and (8)–(14). Spruce planted 30–40 years ago on (*d*) is scarcely 1 m. high and is being overtopped by invasive (1), (6), (9), (10), (12) and (15).

292. SAMEK, V. Lesy středního povltaví. Část (1). Polesí Klínec. **[Forests of the Central Vltava region. Part (1). Forests of the Klínec area.]**

Práce výzkum. Úst. lesn. ČSR No. 12, 1957 (7–63). 56 refs. [Cz.russ.g.]

A typological investigation of a forest lying to the south of Prague (between the Brdy Forest and the Vltava river), which has been exposed to human influence since the 11th century. Seven forest communities are distinguished, for which floristic data are tabulated. Most widely distributed is an Oak/Beech sub-association rich in *Luzula albida*. These mixed forests have been largely transformed into Pine, which is leading to increasing soil degradation. Hence it is intended to introduce Oak and Beech in future. *From author's summary.*

293. MRÁZ, K. Subkontinentální doubravy ve středním Polabí. **[Sub-continental Oak forests in the central Elbe valley.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 4 (1), 1958 (39–66 + 2 tbls.). 57 refs. [Cz.russ.g.]

Discusses the geology and climate of the region and the forest types represented. The widespread *Querceto-Potentilletum albae* is considered to be an outlier of the connected range of similar forests found in S. Russia, Poland, E. and Central Germany, and also in Hungary. The present system of management, mainly coppice with standards, is well suited for conversion to a selection system.

294. NOVOTNÁ, Z. Příspěvek k poznání lužních společenstev středního Polabí. **[On the flood-plain communities of the central Elbe region.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 4 (2/3), 1958 (87–98 + 6 pp. tbls. + 1 map). 21 refs. [Cz.russ.g.]

Defines the plant communities of the region on the basis of the average ground-water level, the dominant herbaceous types, and stand density.

295. MATUSZKIEWICZ, W., TRACZYK, H., and TRACZYK, T. Materiały do fitosocjologicznej systematyki zespołów olszowych w Polsce. **[The classification of the swamp forest associations (*Alnetalia glutinosae*) in Poland.]** *Acta Soc. Bot. Polon.* 27 (1), 1958 (21–44). 20 refs. [Pol.pol.g.] O.B.D.

296. NICOLÁS, A. Consideraciones ecológicas sobre el pino laricio de Cuenca. **[Ecological notes on *Pinus nigra* in the region of Cuenca.]** [*Docum.*] *Wkg. Party on Ecology FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/EC/3-A*, 1958. pp. 4. [Span.] Limited distribution.

Pinus nigra stands cover 110,000 ha. in this region of Castile, in a zone between 800 and 1600 m. alt. At the lower limit it is mixed with *P. pinea* and *P. halepensis* and at the upper it gives way to *P. sylvestris*. Some account is given of the associated vegetation, the *P. nigra* zone being divided into 3 vegetational sub-zones: (1) 800–1000 m., characterized by abundant maquis of *Rosmarinus officinalis* with some *Juniperus oxycedrus* and *Quercus coccifera*; (2) 1000–1300 m., dense maquis of *Genista scorpius* and *Lavandula latifolia*; (3) 1300–1600 m., dense maquis of *Buxus sempervirens* with some *Juniperus sabina*. Optimum conditions for regeneration of *P. nigra* are found in (2).

297. BEL'GARD, A. L. Nekotorye voprosy stepnogo lesovedenija. **[Some problems of forest ecology in the steppe zone.]** *Bot. Ž.* 43 (2), 1958 (215–28 + 2 tbls.). 44 refs. [Russ.e.]

On the basis of work done mainly by the Dnepropetrovsk State University, classifies and tabulates the various forest types of the S.E. part of the Ukraine, on areas flooded for long or short periods, or not flooded, subdivided by soil fertility classes; compares the biocoenoses of steppe and forest; and lists the site factors affecting growth in the steppe zones of the Ukraine.

298. RUBCOV, N. I. Kratkij obzor tipov rastitel'nosti Kryma. **[An outline of the vegetation types of Crimea.]** *Bot. Ž.* 43 (4), 1958 (571–7). 35 refs. [Russ.]

Distinguishes 10 main types of vegetation, and discusses each individually. The four forest types are: broadleaved deciduous (*Fagus taurica, Quercus sessiliflora, Q. robur, Q. pubescens, Acer stevenii, Alnus glutinosa*); 'small-leaved' deciduous (*Populus tremula, Betula verrucosa*), of which very little exists; coniferous evergreen (*Pinus pallasiana, P. hamata, P. stankewiczii*); and Juniper (*Juniperus excelsa, J. foetidissima*). In addition there are xerophytic or hemixerophytic shrub (šibljak), *Pistacia mutica* 'savanna', as well as grassland and desert formations.

299. CHI-WU, W. **The vegetation of eastern Asia [i.e. China, Korea and eastern Siberia].** *Repr.* from *Proceedings of the 8th Pacific Science Congress, Manila* 4, 1957 (115–25).

The forest types described are: (1) mixed northern hardwoods, (2) deciduous Oak, (3) Birch, (4) montane boreal coniferous, (5) mixed mesophytic, (6) evergreen Oak, (7) rain forest, and (8) high montane.

300. SASAKI, Y. Pflanzensoziologische Untersuchungen über Buchenwälder am Berg Kammuri, Provinz Hiroshima. **[Plant-sociological investigations in Beech forests on Mount Kammuri, Hiroshima province.]** *Bot. Mag., Tokyo* 70 (833/834), 1957 (341–7). 15 refs. [G.g.] I.M.I.

Distinguishes the sub-association *Saseto-Fagetum crenatae symplocetosum.*

301. WARD, R. T. **The Beech [*Fagus grandifolia*] forests of Wisconsin—their phytosociology and relationships to forests of the state without Beech.** *Ecology* 39 (3), 1958 (444–57). 31 refs.

302. BROWN, H. E. **Gambel Oak [*Quercus gambelii*] in west-central Colorado.** *Ecology* 39 (2), 1958 (317–27). 10 refs.

Oak brush (mainly *Q. gambelii*) occupies ca. one million acres on the hillsides of W. Colorado between 7000 and 9000 ft. alt., and is regarded either as a soil conserving type or as an obstacle to grazing. The present study aims at reconciling these views by providing information on the ecological characteristics of the type and evidence as to its extent and density and how far these are changing.

303. LE CACHEUX, P. Application des méthodes statistiques à l'étude des forêts équatoriales. **[The application of statistical methods to the study of**

tropical forests.] *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (698–709). [F.]

Discusses mainly the questions of sampling (with emphasis on the importance of coefficients of variation), and the laws of distribution (both diameter classes and species) in tropical forests, with some illustrations from the French Cameroons.

304. MISRA, R. [Editor]. **Vegetation types of India (Summaries of papers read at the Symposium held under the auspices of the Indian Botanical Society during the Baroda Session of the Indian Science Congress, 1955).** *J. Indian bot. Soc.* 36 (4), 1957 (587–605). O.B.D.

Includes the following papers: A discussion on the climatic climax community in Central India (*C. E. Hewetson*); General features of the lower and middle hill forests of East Nepal (*M. L. Banerji*); Ecology of forest types bordering Rajasthan and Uttar Pradesh about the district of Agra (*S. Sinha* and *K. C. Basu-Chaudhary*); The ecology of Sal (*Shorea robusta*) in Madhya Pradesh (*G. S. Puri*); Teak-bearing forests of Madhya Pradesh (*K. K. Bhatia*); Vegetation types in Western India (*H. Santapau*); Vegetation types of the N.-W. Himalayas (*G. S. Puri*); and Vegetation types in the Siwaliks between the Ganges and the Jamuna (*G. S. Puri*). [Cf. *F.A.* 20 No. 12.]

305. BANIJBHATANA, D. **Teak forests of Thailand.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (299–311). 10 refs. [E.]

Describes the principal forest types, stocking of Teak, reservation, and working plans. [Cf. *F.A.* 20 No. 1293.]

306. RICHARDS, P. W. **The concept of the association in the tropical rain forest.** *Proc. 8th int. bot. Congr. 1954 Sect. 7–8*, 1957 (155–62). [E.]

The author maintains that, although what he names 'single-dominant forests' constitute distinct associations, mixed rain forest forms a single association—even over very large areas.

307. TROCHAIN, J.-L. Nomenclature et classification des milieux végétaux en Afrique Noire Française. [**Nomenclature and classification of vegetation in French tropical and equatorial Africa.**] *Proc. 8th int. bot. Congr. 1954 Sect. 7–8*, 1957 (106–11). 2 refs. [F.]

Proposals for nomenclature, with definitions.

308. DEVRED, R. La végétation forestière du Congo Belge et du Ruanda-Urundi. [**Forest vegetation of the Belgian Congo and Ruanda-Urundi.**] *Bull. Soc. for. Belg.* 65 (6), 1958 (409–68 + 3 photos + loose map). 61 refs. [F.]

A detailed description of the principal forest types, with a tentative map showing their distribution.

309. GERMAIN, R., and EVRARD, C. Caractères structurels du groupement à *Brachystegia laurentii* (D. Wild.) Louis *ex* Hoyle dans la région de Yangambi (Congo Belge). [**Structure of the *B. laurentii* community in the Yangambi region.**] *Proc. 8th int. bot. Congr. 1954 Sect. 7–8*, 1957 (148–51). [F.]

Presents information on the structure and species composition of the forests.

310. GRIFFITH, A. L. Les forêts vierges de l'Afrique de l'Est sous protectorat brittanique. [**Virgin forests of British East Africa.**] *Schweiz. Z. Forstw.* 108 (2), 1957 (102–5). 2 refs. [F.g.]

A description of the main forest types considered virgin, and estimates of the small areas still undisturbed, for Uganda, Kenya, and Tanganyika, with a brief note on Zanzibar.

311. TOMLINSON, T. E. **Relationship between Mangrove vegetation, soil texture and reaction of surface soil after empoldering saline swamps in Sierra Leone.** *Trop. Agriculture, Trin.* 34 (17), 1957 (41–50). 9 refs.

Analyses these relationships, as yet imperfectly understood. Fibrous texture (unsuitable for empoldering) is thought to be due to an accumulation of undecomposed fine *Rhizophora racemosa* roots. This species is usually found on the lowest, permanently waterlogged areas. Fibrous soil is unusual under *Avicennia nitida*.

312. CHAPMAN, V. J., and RONALDSON, J. W. **The Mangrove and salt-marsh flats of the Auckland isthmus.** *Bull. Dep. sci. industr. Res. N.Z.* No. 125, 1958. pp. 79. 65 refs.

A study of the soils and ecology. The Mangrove, at the southern limit of its range in New Zealand, is represented by only one species, *Avicennia marina*.

313. LÖTSCHERT, W. Die Übereinstimmung von geologischer Unterlage und Vegetation in der Sierra de los Órganos (Westcuba). [**Agreement between geological substratum and vegetation in the Sierra de los Órganos (W. Cuba).**] *Ber. dtsch. bot. Ges.* 71 (2), 1958 (55–70 + 1 plate). 21 refs. [G.] O.B.D.

2. SILVICULTURE

See also Nos. 218, 228–30, 907.

314. **Forestry practice: a summary of methods of establishing forest nurseries and plantations with advice on other forestry questions for owners, agents and foresters.** *Bull. For. Comm., Lond.* No. 14 (7th ed.) 1958. pp. 93. Price 5*s.* 6*d.*

A fully revised edition of a bulletin first published in 1933. In addition to nursery practice and establishment of plantations, it covers tending, thinning, and protection.

315. Vorträge zum 'dies academicus' der Forstwirtschaftlichen Fakultät Eberswalde vom 3 bis 5 Oktober 1957. [**Lectures at the 'dies academicus' of the Eberswalde Forest Faculty, 3–5 Oct. 1957.**] *Arch. Forstw.* 7 (3), 1958 (165–256). 69 refs. [G.g.russ.e.]

Includes the following: How much general interest can high-mountain silviculture research claim? (*J. Pockberger*); The profitability and

silviculture of Spruce in the N.W. German diluvial region (*E. Wagenknecht* and *G. Belitz*); The importance of regional sampling inventories (*A. Richter*) [discusses European examples and recommends the Swedish 'Reichswaldtaxation']; and The present opportunity for a pool of aircraft for forest pest control in E. Germany (*H. Gäbler*). Three other articles are noticed separately.

316. FISCHER. Die Buchen-Wirtschaft auf der mittleren Alb. **[Management of Beech in the central Alb [Swabia].]** *Allg. Forstzeitschr.* 13 (11), 1958 (162–3). [G.]

From practical experience the author advocates crown thinning in Beech stands in the region, and the introduction of light-demanding species (e.g. Ash, Maple) into pure Beech stands, and gives details of these measures.

317. MILAS, B. Gospodarenje šumama primorske bukve. **[The management of coastal Beech forests.]** *Šum. List* 82 (3/4), 1958 (81–94). [Croat.e.]

The growth is described and management problems are analysed of Beech forests occurring extensively at 500–1200 m. alt. on limestone along the N. Adriatic coast in Croatia. Recommendations are made on the intensity of fellings necessary to give natural regeneration, which is suppressed by *Sesleria autumnalis* when the canopy is opened too much. The introduction of Silver Fir and Spruce is strongly recommended. Analysis of 1–3 logs in 8 diameter classes showed the timber to be of high quality, 70% of the assortments being large enough for industrial use, including mining.

318. Traitement et aménagement des forêts méditerranéennes: France. **[Treatment and management of Mediterranean forests: France.]** [*Docum.*] *6th Sess. FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/66-B*, 1958. pp. 7. [F.] Limited distribution.

Summarizes the trends in silvicultural systems and forest management in Mediterranean France, with some recommendations for the future.

319. ALVAREZ DE MON, R. Tratamiento y ordenación de los montes mediterráneos: España. **[Treatment and management of Mediterranean forests: Spain.]** [*Docum.*] *6th Sess. FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/66-A*, 1958. pp. 10. [Span.] Limited distribution.

Summarizes the trends in silvicultural systems and forest management in Spain to the present time, and makes some recommendations for future developments.

320. HOLDRIDGE, L. R. **Pines and other conifers [in Latin America].** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (438–44). 8 refs. [E.f.]

Notes on distribution, silviculture, protection and yield, and the more pressing needs for research.

321. LIZARDO, L. **The Philippine Pine forests.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (450–72). [E.]

Describes the forests of *Pinus insularis* and *P. merkusii*—history, site factors, silvicultural characters, silviculture, protection, yield and research.

322. ROGERS, L. J. **Pine and other conifers [in tropical Queensland].** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (431–7). [E.f.]

Notes on composition of the Kauri (*Agathis* spp.) forests and on Hoop Pine (*Araucaria cunninghamii*) regeneration, and increment of these species and of Podocarps and of the exotic Pines (*Pinus elliottii* and *P. patula*).

323. SAH, D. L. **Pine and other conifers [in India].** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (445–9). [E.]

Notes on the Himalayan conifer forests, their composition, regeneration, and management.

324. SAGREIYA, K. P. **Methods of increasing growth and obtaining regeneration in the deciduous forests of Central India.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (363–88). 21 refs. [E.f.]

Describes the principal forest types of western Madhya Pradesh, silvicultural methods (with special reference to Teak), protection, and questions needing research.

325. GHANI, Q. **Heterogeneous types of tropical forests—Chittagong forests.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956[1958] (130–41). [E.f.]

The forests vary from tropical rain forest to mixed dry dipterocarp forest, the most important species in both being dipterocarps. The paper describes sites, composition, silviculture, protection, and research in progress.

326. NAIR, K. N. R. **Tropical rain forest [in Madras State].** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (209–14). [E.]

Describes silvicultural methods, and particularly methods of encouraging natural regeneration.

327. BANERJI, J. **Tropical rain forest [in the Andamans].** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (142–51). [E.]

Covers sites, forest types, difficulties of regeneration, and silviculture, with a comparative table showing regeneration methods for tropical rain forest as practised in the Andamans, Malaya, Nigeria and Ghana, and Trinidad.

328 LANDON, F. H. **Malayan tropical rain forest.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (107–8). 18 refs. [E.f.]

Describes sites, composition, silviculture, protection, and research in progress.

329. DONIS, C. La forêt dense congolaise et l'état actuel de sa sylviculture. **[The dense forest of the Congo and the present state of forestry in it.]** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (22–56). 22 refs. [F.]

330. WADSWORTH, F. H. **Tropical rain forest. The *Dacryodes-Sloanea* association of the West**

Indies. *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (119–29). [E.f.]

Describes sites, composition, silviculture, protection, and research in progress (mainly at the U.S. Tropical Forest Research Center in Puerto Rico).

331. HOLDRIDGE, L. R. **The silviculture of natural mixed tropical hardwood stands in Costa Rica.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (163–72). 5 refs. [E.f.]

332. BANERJI, J. **The Mangrove forests of the Andamans.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (425–30). [E.]

Describes the forests and their exploitation, with particular reference to the silvicultural characters and silviculture of *Bruguiera gymnorhiza* and its utilization for transmission poles.

333. NOAKES, D. S. P. **Mangrove.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (415–24). 17 refs. [E.f.]

Describes the composition, site factors, silviculture, protection and yield of Malayan Mangrove forests, with some notes on current research.

22. Silvicultural Systems. Constitution and Composition of Stands; Forms of Stand

221. High Forest Systems

See also Nos. 65, 351, 884.

334. BRUCHHÄUSER, H. Buchenwirtschaft im Wuchsgebiet südlicher Vogelsberg auf für die Buche optimalen Standörtlichkeiten. Buchenverjüngung auf grosser Fläche im Breitschirmschlag. **[Beech management and natural regeneration of Beech by the uniform system on optimum sites on the Southern Vogelsberg [Hesse].]** *Allg. Forst- u. Jagdztg.* 129 (6), 1958 (115–20). 4 refs. [G.e.]

Describes the successful application of the method as employed since 1926, after strip systems had largely failed and proved too slow. Seeding fellings during mast-fall helped to scarify the soil and increased germination. *From author's summary.*

335. CROSS, R. L. **Growth, vigour and mortality of residual Hemlock-hardwood following a partial cutting.** *Tech. Note Lake St. For. Exp. Sta.* No. 526, 1958. pp. 2. 2 refs.

During the 12-year period after cutting, mortality both of Hemlock and of the hardwoods (mainly Yellow Birch) was slight. During the last 5 years the mean diam. growth of Hemlock (0·99 in.) increased over that of the previous 5 years (0·83 in.) while that of Yellow Birch declined (to 0·79 from 0·86 in.). A salvage operation 3–5 years after the critical cut is recommended for both Hemlock and hardwoods.

336. CURTIS, J. D., and WILSON, A. K. **A test of group selection in Idaho Ponderosa Pine.** *J. For.* 56 (3), 1958 (182–9). 10 refs.

Describes 10 cutting systems applied since 1939 with indifferent or no success to the large *Pinus ponderosa* areas of Idaho where site and climate often combine to make natural regeneration unsatisfactory; and gives details of the procedure adopted in tackling the regulatory problems of the group selection method applied in the Boise Basin Experimental Forest [see *F.A.* 18 No. 1440]. During the first phase of this method of regeneration, the % of volume in trees of high insect risk was reduced, mainly by clear felling areas of $\geq$ 1 acre in groups of overmature and/or mature sawtimber trees. Suggestions for large-scale application of group selection management are also made.

222. Coppice, Pollarding and Lopping Systems

See Nos. 337–9.

226. Changes of Silvicultural System. Conversion (by System or Species)

See also No. 479.

337. DANNECKER, K. Umwandlung oder Umbau von Laubmittelwald? **[Conversion of hardwood coppice-with-standards, or gradual structural change?]** *Allg. Forstzeitschr.* 13 (28), 1958 (397–9). 15 refs. [G.]

Describes the gradual changing of a hardwood coppice-with-standards, with some Spruce, into a 'Dauerwald' by methods of 'single-stem forestry' and the increase of medium and large diameter classes etc. over a period of 15 years on a small estate.

338. Konference o převodech pařezin. **[Conference on the conversion of coppice forests.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 30 (2), 1956. pp. 176 + 1 dgm. Many refs. [Cz.cz.russ.g.]

An issue devoted to papers given at a conference in July 1956, organized by the Forestry Department of the Czechoslovakian Academy of Agricultural Sciences, in cooperation with the Commission for Silviculture. The papers reported are: Site conditions of coppice forests in Czechoslovakia (*J. Pelíšek*); Coppice forests from the point of view of changes brought about by human influence, and the rôle of ecology and the classification of vegetation in the conversion of coppice forest (*A. Zlatník*); Silvicultural technique in the conversion of coppice forest (*B. Polanský*); Conversion technique with regard to the establishment of Oak forests (*M. Vyskot*); Conversion and management (*V. Korf*); Outline of a new method of management in the conversion of coppice to high forest (*B. Doležal*); The management of operations to convert coppice to high forest (*R. Viewegh*).

339. REGENT, B. Gospodarenje u listopadnim primorskim šumama niskog uzgoja i njihovo meliorivanje. **[The management and amelioration of broadleaved coppice forest in coastal regions [of Istria].]** *Šum. List* 82 (3/4), 1958 (94–101). 7 refs. [Croat.e.]

Notes on climate, geology and ecology in the belt of broadleaved forest around the Kvarner bay (Istrian peninsula). The main forest communities are *Querceto-Carpinetum orientalis croaticum* and *Querceto-Ostryetum carpinifoliae* (the main species being *Quercus pubescens*, *Carpinus betulus*, *C. orientalis* and some *Castanea sativa*) existing in the form of degraded coppice or scrub as a result of grazing and man's activity. On the basis of experience in other regions, recommendations are

made for improving these forests by extending the rotation of simple coppice from 10–12 to 20 years, converting simple coppice to coppice with standards (where possible, conifers), and on very bad sites felling and replanting with conifers, a guide being given to the species suitable for different site conditions.

228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See also Nos. 291–2, 837, 871–2, 884.

340. BONNEMANN, A. Über Mischbestände. **[On mixed stands.]** *Forst- u. Holzw.* 13 (14), 1958 (253–60). 8 refs. [G.]

Discusses the merits of mixtures as a silvicultural means of assuring sustained yield, using examples of Beech/Oak, and Beech/Pine, in W. Germany.

341. RICHTER. Japanerlärche als Vorfrucht der Fichte. **[Japanese Larch planted with Spruce for earlier utilization.]** *Allg. Forstzeitschr.* 13 (24), 1958 (343–6). [G.g.]

In planted even-aged mixtures in the Sauerland, except where Larch density was very high (> 65 cu.m./ha. at 13, and > 100 at 20 years), stocking of Spruce was adequate at ca. 2600/ha. Mean height of Spruce at 20 years was 4·2 m. compared with a yield-table figure of 5·1 m. for site class II. It is estimated that if the Larch is removed by stages over 30 years, giving a total yield of ca. 100 cu.m./ha., the corresponding loss in Spruce yield over an 80-year rotation would not exceed 40 cu.m./ha. All Larch had to be pruned.

23. Regeneration and Formation of Stands

342. KADAMBI, K. **Methods of increasing growth and obtaining regeneration of tropical forests.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (173–84). 32 refs. [E.f.]

Briefly reviews the methods employed in India in the tropical wet evergreen, tropical semi-evergreen, tropical moist deciduous, and tropical dry deciduous forests.

343. SETH, S. K., and KHAN, M. A. W. **Regeneration of Teak forests.** *Indian For.* 84 (8), 1958 (455–66).

Forests of the Teak zone of India are described. Champion's types of Teak forest are discussed and proposals made for a revised classification of types, to meet the requirements of intensive management practices at present followed. Factors controlling the occurrence and development of regeneration are detailed and proposals are made for future research to solve the problems of natural and artificial regeneration in the Teak zone of India. *Authors' summary.*

344. KADAMBI, K. **Natural regeneration of Teak [in India].** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (293–8). 15 refs. [E.]

345. ALPHEN DE VEER, E. J. VAN, *et al.* **Teak cultivation in Java.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (322–38). 8 refs. [E.]

Describes and discusses the taungya method of establishment and underplanting with *Leucaena glauca*, which are the standard practice in Java, and gives some yield-table data.

346. AUBRÉVILLE, A. Sylviculture dans les forêts tropicales hétérogènes. **[Silviculture in heterogeneous types of tropical forest.]** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (152–62). [F.e.]

Describes and discusses methods of regeneration now being practised in tropical Africa—uneven-aged crop method, controlled taungya, strip planting, and enrichment by successive stages.

347. HALEY, C. **Forestry in tropical rain forests of Australia with special reference to the present status of research work.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (219–34). [E.]

Describes the forest types and research on regeneration methods. Intensive treatment recommended for selected forests with favourable conditions is: (1) Malayan type of linear sampling; (2) logging with retention of seed-trees above girth limits and thinning below these limits; (3) reduction of canopy by girdling; (4) underplanting with desirable species and encouragement of natural regeneration to fit in with seed crops; (5) intensive early tending of planted species and natural regeneration.

231. Natural Regeneration

See also Nos. 271–4, 334, 344, 347, 387, 389.

348. ŘEHÁK, J. Přirozené zmlazování smrku v oblasti horské smrčiny. **[The natural regeneration of Spruce in the montane Spruce forest region.]** *Práce výzkum. Úst. lesn. ČSR* No. 13, 1957 (33–66). 11 refs. [Cz.russ.g.]

Deals with studies made in 1936–38 in the Černé Jezero and Čertovo Jezero forest nature reserves in the Böhmerwald (alt. 1000–1350 m.), giving a general description of the natural conditions of the region, followed by the results of investigations of seed quality (including embryo development) and germination on various natural seedbed materials in the laboratory, and field studies of regeneration, partly on variously prepared seedbeds on sites having different ground-vegetation types, and partly over the remainder of the area. Where the ground cover consisted of *Vaccinium myrtillus* or mosses, regeneration was good and soil preparation unnecessary. Grasses or *Athyrium alpestre* were entirely unfavourable to regeneration. On steep slopes all methods of seedbed preparation were detrimental, owing to run-off and erosion; only on moderate slopes could some such measures be taken to control grass and ferns, e.g. by burning. Run-off during snow-melt or heavy rain is one of the chief dangers to seedlings, and successful regeneration is usually confined to raised situations such as rocks, stumps, and fallen stems; promising stands of seedlings are often destroyed during the snow-melt period. The requirements for good natural regeneration are not only a good seed-year (and these occur only at 5- to 9-year intervals) but also suitable weather during the whole period of germination and

establishment. Young growth may be destroyed, especially by run-off, up to the 3rd year or even later. Spruce stands in this region are exposed to a very harsh climate; damage by snow, ice and wind is common, and the growing season is deficient in warm, sunny days.

349. GHENT, A. W. **Studies of regeneration in forest stands devastated by the Spruce budworm. II. Age, height-growth and related studies of Balsam Fir seedlings.** *For. Sci.* 4 (2), 1958 (135–46). 9 refs.

[Cf. *F.A.* 19 No. 253.] Studies of the age and height distribution of Balsam Fir reproduction present after a recent budworm outbreak, and of the flowering history of overwood survivors, showed that the seedling population represented an accumulation built up 20–30 years before the infestation and that an early effect of defoliation was the cessation of cone production. In the pre-outbreak period the shade-tolerant, severely suppressed Fir seedlings grew ca. 1 in./year. Damage to their leaders by falling late-instar larvae nullified the release effect of overstorey defoliation during the outbreak, but when the peak of this was passed and heavy overstorey mortality began, there was an immediate response in height growth. Terminal lateral-bud number is linearly correlated with leader length and appears to be an equally valid criterion of Fir seedling vigour. The beginning, peak and end of a recent outbreak are accurately determined from the evidence of damage of the late instars to the Fir seedling stem. In these stands, described as an unstable 'catastrophic climax' of White Spruce/Balsam Fir, nearly 8 million seeds/acre of the latter were produced over a 37-year period, with one seedling established per 1500 seeds. In the first half of this period one seedling per 600 seeds was established, suggesting that the availability of seedling niches quickly becomes limiting, and that the harvesting of Balsam Fir as early as economically feasible, may entail relatively little sacrifice in seedling numbers.

350. FERGUSON, E. R. **Age of rough (ground cover) affects Shortleaf Pine establishment and survival.** *J. For.* 56 (6), 1958 (422–3). 1 ref.

Studies of prescribed burning in Texas, begun in 1952, enabled a comparison to be made of the germination, establishment and survival of *Pinus echinata* in Pine/hardwood upland stands burned at different seasons of the year, and at intervals of 3 to 43 months before the heavy *P. echinata* seed-year of 1955. The average seed-fall was 455,000 seeds/acre but, owing to a droughty winter following, germination averaged only 3·7%. The germination % was lower, the longer the interval between burning and seed-fall. In early July survival was similar on all treatments, but by the end of September (after a dry summer) there were differences in survival indicating the superiority of growing-season over dormant-season burns.

351. LEAK, W. B., and WILSON, R. W., JR. **Regeneration after cutting of old-growth northern hardwoods in New Hampshire.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 103, 1958. pp. 8. 3 refs.

A tally was made in the Bartlett Experimental Forest of the height and species composition of advance reproduction (stems > 1 ft. high and < 1·5 cm. d.b.h., on 90% of the area), before felling, and the height and species of dominant (mostly seedling) reproduction 10–15 years after felling, on a total of 1334 milli-acre plots on 3 sites, subjected to (*a*) clear-felling, (*b*) improvement felling, removing ca. ⅓ of the b.a., in stems of all sizes, and (*c*) clear-felling in patches of 0·1–0·6 acre, totalling 10·5% of the area. Hardwoods were felled to a minimum d.b.h. of 1·6 in. on all three. In the overstorey, Beech predominated, then Yellow Birch and Sugar Maple. After 10–15 years, stocking with potential crop trees was adequate, ranging from 89% for plots on (*a*) to 65% for plots on (*b*). On (*b*), tolerant species, i.e. Beech and Sugar Maple, predominated; on (*c*) the semi-tolerant Yellow Birch and White Ash were also present in a 1/2 ratio; on (*a*) the intolerant Paper Birch and Aspen also occurred in ca. the same % as Beech and Maple. On (*b*) and (*c*) the presence of advance reproduction consisting mainly of tolerant species, ensured a significantly larger % of these species among the dominants 10–15 years later. The response of Sugar Maple advance reproduction and seedlings to felling on (*b*) was 2–3 times that of Beech.

352. **Sycamore regeneration.** *Newslett. N.Z. For. Serv.* 8 (6), 1958 (2).

A mixed firebreak of Sycamore Maple [*Acer pseudoplatanus*] and Lombardy Poplar was planted ca. 2 chains N. of a *Pinus radiata* stand (30 years old) in North Island. A heavy volunteer growth of Sycamore Maple, ranging in height from 6 in. to 6 ft. 6 in., was found as far from the margin as 70 yd. into the stand. No Poplar was noted under the Pine canopy, which had an average density of 0·7.

353. **[Natural regeneration of Kauri (*Agathis macrophylla*).]** *Rep. For. Dep. Brit. Solomon Isles Protect. 1956* [1957?] (3–4).

Experiments were made with the aim of giving early release to young Kauri seedlings, which are usually found in some abundance shortly after exploitation. Lines were cut through the undergrowth at intervals of 30 ft., and Kauri seedlings freed by slashing the small weed growth. Inspection at the end of 1956 [date of experiment not given] indicated that the number of seedlings surviving between the lines was not appreciably less than the number on treated areas, and that they were at least as healthy, if not more so. It seems that Kauri is well able to tolerate shade in its early stages, and that the present method of cutting the undergrowth before woody regrowth has been able to establish a low canopy, probably stimulates weeds.

354. NICHOLSON, D. I. **Natural regeneration of logged tropical rain forest, North Borneo.** *Malay. Forester* 21 (2), 1958 (65–71). 7 refs.

A short review of some silvicultural characteristics of the Dipterocarpaceae shows that the successful regeneration of logged virgin forest depends on the seedlings already on the ground and that these need abundant light before rapid growth takes place. The present method of treating logged forest is then

discussed, followed by some suggested lines of research that might be needed to improve it. The most important of these are the most suitable time for regeneration tending operations, and the amount of commercial timber of small size that should be left for a following crop. *Author's summary.*

232. Artificial Regeneration

355. ALPHEN DE VEER, E. J. VAN, *et al.* **Artificial regeneration of *Agathis loranthifolia*.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (557–64). 4 refs. [E.]

Describes cone collection, extraction etc., nursery practice, planting technique, growth and yield, of *A. loranthifolia* in Java.

356. ALPHEN DE VEER, E. J. VAN, *et al.* **Artificial regeneration of *Pinus merkusii*.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (565–72). 7 refs. [E.]

Describes seed collection, nursery practice, planting technique, growth and yield, of *P. merkusii* in Java.

357. VALENTINI, J. A. La reforestación con quebracho colorado en la formación fitogeográfica del Parque Chaqueño. [**Afforestation with *Schinopsis balansae* in the phytogeographical type of the Parque Chaqueño.**] *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (552–6). [Span.]

Describes successful experiments in Argentina on clay soils that retain moisture without becoming waterlogged. Techniques include planting of pot plants on ploughed ridges at 3 × 2 m. spacing with agricultural crops between the ridges, and direct sowing also on ploughed ridges.

232.1. Choice and Trial of Species, Races etc.

See also Nos. 50, 291–2, 468–70.

358. Especies forestales utilizadas en la repoblación de las zonas áridas de Argentina. [**Forest species used in replanting of the arid zones of Argentina.**] *Montes, Madrid* 14 (81), 1958 (228). [Span.]

Lists the botanical names of tree species that will thrive in each of the following arid regions: Quebrada 'Volcán', Salliquelo, Bahía Blanca, Comodoro Rivadavia, El Coite, and Trevelin.

232.11. Species Trials, including Forest Gardens, Trials of Exotics etc.

See also Nos. 261, 322, 466, 474, 481, 1268.

359. GREEN, R. G. ***Pinus radiata* in Great Britain.** *Aust. For.* 21 (2), 1957 (66–9).

Discusses the adaptability of *P. radiata* to the British climate. Lack of summer warmth and the shortness of the growing period are probably more important than extreme minimum temperature in limiting its distribution in Britain. Increment in a Devon stand is compared with figures from Australia. Heavy branching in British trees is probably due to damage by the Pine shoot moth, high nutrient content of the soils, and a shorter growing season. Direct spot sowing in the south of England has been successful where rodent populations are small. In heather country, deep single-furrow ploughing gives a good sowing medium if the soil is kept compacted. Phosphatic manures increased early height growth. Two fungus and 4 insect enemies, apart from the Pine shoot moth, are reported so far in the U.K.

360. GENSSLER, H. Über die Anbauwürdigkeit der westamerikanischen Hemlock (*Tsuga heterophylla*) in der niederrheinischen Tiefebene. [**The suitability of *T. heterophylla* for the plains of the Lower Rhine.**] *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 3, 1958 (37–40). [G.]

Briefly describes a mixed stand near the Dutch border, in which the Hemlock, planted ca. 25 years ago to beat up a defective Douglas Fir stand under an Oak/Pine overstorey on a poor, podzolized, waterlogged site, exceeded in mean height (13·5 m.) and d.b.h. (12 cm.) the Douglas Fir, its senior by ca. 7 years.

361. MOOSMAYER, H.-U. Ein Vorkommen von *Fagus orientalis* Lipsky im Forstbezirk Schrezheim (Schwäbisch-Fränkisches Keuperbergland). [***F. orientalis* in Schrezheim district (Swabo-Franconian keuper hills).**] *Allg. Forstzeitschr.* 13 (32), 1958 (453–5). 9 refs. [G.g.]

Describes a small stand of *F. orientalis*, now 39 years old, forming part of the understorey of an Oak stand, including differences in the soil under *F. orientalis* and *F. sylvatica*, comparative leaf analyses etc. The % of ash, SiO_2, Mg, Mn and N was markedly higher, Ca and K lower and flushing earlier in the former. Growth differences were small, but *F. orientalis* had a slightly higher mean diam. and its litter apparently decomposed more rapidly.

362. KORENEK, J. Aklimatizácia exotických drevín v oblasti Banskej Štiavnice. [**The acclimatization of exotics in the Banská Štiavnica region.**] *Lesn. Čas.* 3 (4), 1957 (323–41). [Slovak.]

Lists the exotics in the Feistmantlov gardens (2·3 ha.; established 1836) and in the Arboretum at Kysihýbl (7·7 ha.; 1900), and discusses the findings as to successful acclimatization.

363. ZAVADIL, Z. Výskyt korkovníku v ČSR. [**The occurrence of *Phellodendron* spp. in Czechoslovakia.**] *Sborn. čsl. Akad. zeměd. (Lesn.)* 3 (1), 1957 (1–16). 18 refs. [Cz.russ.e.]

A survey of the *Phellodendron* spp. cultivated in scattered localities in Czechoslovakia and the quality of the cork produced. *P. amurense*, in particular, appears to thrive, though at present only isolated trees of good quality are to be found. Such trees should be used as a seed source for establishing future plantations. *From author's summary.*

364. Numero speciale dedicato alle conifere a rapido accrescimento. [**Special number devoted to conifers of rapid growth.**] *Monti e Boschi* 9 (7/8), 1958 (293–479). [It.]

[Cf. *F.A.* 19 No. 1456.] Contains a number of articles on the silvicultural characters, ecology etc. of *Pinus strobus*, *P. rigida*, *P. radiata*, *Pseudotsuga*

taxifolia, and *Larix leptolepis*, their wood properties and uses, and their performance in Italy, by a number of authors (*G. Piccarolo*; *A. Pavari*; *R. Morandini*; *V. Bellucci*; *G. Gambi*; *A. Baridon*; *G. Giordano*; *F. Feretti* and *E. Grandis*).

365. HEJAZI, R., TABATABAI, M., and MOSLEMI, A. A. **[Study on softwood trees in Iran.]** *Bulletin, Forestry & Wood Technology Laboratory, University of Tehran* No. 15, 1958. pp. 51 + 4 + 9 photos. 6 refs. [Per.e.]

The native conifers, because of their slow growth and small size, are considered unsuitable for afforestation programmes. Of exotic species tested for germination, reaction to transplanting, and early growth, *Pinus eldarica*, *P. nigra* vars. *calabrica* and *austriaca* and *Cupressus arizonica* gave the most promising results, and all are considered suitable for afforestation and for ornamental use. Details of early growth resistance to drought, frost, and pests, germination results, and recommendations for nursery treatment are given for each species. *From authors' summary.*

366. KARSCHON, R. **Eucalypts for dry areas.** [*Docum.*] *3rd Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, 1958. pp. 4.

A preliminary report on trials at Snaim near Beersheba, Negev (annual rainfall 227 mm.) in 1953 with 31 tree or mallee species, ball-planted after ploughing, on calcareous sandy loam of pH ca. 8, and some later plantings. *Eucalyptus astringens*, *E. brockwayi*, *E. dundasii*, *E. falcata*, *E. leucoxylon*, *E. occidentalis* and *E. torquata* showed promise.

367. CARRERAS, A. DE LAS. Observaciones sobre el comportamiento de *Eucalyptus camaldulensis* en la Provincia de Buenos Aires (R. Arg.). **[Behaviour of *E. rostrata* in Buenos Aires province, Argentina.]** *Rev. for. argent.* 2 (2), 1958 (52–4). 6 refs. [Span.]

Presents notes on silvicultural characters and growth habit, and data on the development of 3 different types of stand in this region. M.a.i. varies widely (the examples range from 14·15 cu.m. in an 8-year stand to 47 cu.m./ha. in a 6-year stand). It is important to choose good soils when establishing commercial plantations.

368. LIZARDO, L. **Results of trial plantings of *Eucalyptus* in the Philippines.** *Filipino For.* 9/10, 1958 (73–8, 103–9).

Trials of a number of Eucalypts are in progress in different parts of the islands. *E. robusta*, *E. rostrata*, *E. tereticornis*, *E. citriodora*, *E. globulus*, *E. viminalis*, *E. pulverulenta*, *E. saligna* and *E. deglupta* all show promise. Further study is recommended of the silvicultural characters of *E. deglupta*, the one species indigenous to the Philippines.

369. SPRENGEL, E. A. **A Mallet plantation in Western Australia.** *Aust. For.* 21 (2), 1957 (92–6). 2 refs.

Describes an 18,000-acre plantation of *Eucalyptus astringens* at Dryandra, near Narrogin, the climate and soils, and methods used in establishing, tending and thinning, and gives average yields of tanbark from trees of 9 different d.b.h. measurements.

370. BRIZICKY, G. K. **The introduction of *Centrolobium ochroxylum* into Africa.** *Brittonia* 10 (3), 1958 (105–9). Several refs.

This species was introduced (apparently as a single tree in each locality) into the botanical garden at Victoria (Cameroons) and Mombo (Tanganyika) when these were German colonies. No trace remains of the tree at Mombo, but the specimen at Victoria is said to be a fine one [no further details given]. *C. ochroxylum* deserves further investigation as a possible timber species for plantations in both Africa and the New World.

371. QUINT, P. L. Rapport sur le teck au Dahomey. **[Report on Teak in Dahomey.]** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (339–42). [F.]

232.12. Races and Provenance Trials

See also Nos. 150–3.

372. LINES, R., and ALDHOUS, J. R. **Provenance studies.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (51–8).

A study of 1st, 2nd, and 3rd generation *Larix* × *eurolepis* plantings, 20 years old, shows that the 3rd generation is far slower than the 1st or 2nd, but that, in this experiment, there is no clear difference in growth rate between the 1st and 2nd. Results of a *Larix decidua* provenance trial, 19 years old, are reported; in a later Welsh experiment planted in 1952, Polish Larch gave best height growth and Swiss the worst.

373. ČVANČARA, R. Zhodnocení provenienčního pokusu s modřínem polským (*Larix carpatica polonica* Rac.) v oblasti FLH Kostelec n. Č. Lesy. **[Evaluation of a provenance trial with *Larix decidua* var. *polonica* at Kostelec [Czechoslovakia].]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (2/3), 1958 (99–106). 20 refs. [Cz.russ.g.]

Seeds of *Larix decidua* var. *polonica*, gathered from 4 Polish provenances, were planted in Czechoslovakia, and in 1956 (after their 8th growing season) their increment and stem form were compared with those of local Larch of unknown provenance on a control plot. Larch from all 4 Polish provenances had greater increment, but showed varying degrees of stem deformation. The controls had the lowest increment but the best form. The best Polish provenances, i.e. Skarzysko and Mala Wies, show promise, and results of the trial so far indicate that they may well be more profitable than the indigenous Larch.

374. TROEGER, R. Die Fichten-Provenienz-Versuche in Württemberg. **[The Spruce provenance trials in Württemberg.]** *Allg. Forstzeitschr.* 13 (9), 1958 (109–14). 9 refs. [G.]

Comparisons were made of the height growth and flushing (early, medium or late) of Spruce grown from seed from several German provenances at 20–1250 m. alt. in 1937. The transplants were set out in 1941 or 1942 on 3 different sites in Württemberg at altitudes of 440–460, 530–540, and 900–920 m. Late-flushing trees of Silesian provenance were

superior on all the sites; no definite connexion was observed between altitude and rate of growth; almost all the trees retained their provenance's flushing characteristics, irrespective of site; late-flushing trees seemed to be fairly generally (but not definitely) superior; Black Forest provenances were below average in height growth in nearly every case. These results are compared with those of similar trials set up elsewhere [cf. *F.A.* 18 No. 3930], but the comparisons are inconclusive.

375. HOLST, M. J. **How are our White Spruce provenance experiments progressing.** *Pulp Paper Mag. Can.* 59 (6), 1958 (202–3).

Briefly describes existing provenance trials (in Finland and Wisconsin, as well as in Canada), and a more extensive new series of trials planned by the Petawawa Forest Experiment Station.

376. SIHTOLA, H., and KAILA, E. Mäntyrotu Keski-Suomesta selluloosapuuksi Pohjois-Suomeen. **[Pine provenances from central Finland as pulpwood in N. Finland.]** *Pap. ja Puu* 40 (4*a*), 1958 (141–6). 4 refs. [Fi.fi.e.] P.R.

Pine grown in N. Finland, from provenances of N. and Central Finland, was tested for its pulping properties. Very little difference was found between the sulphate pulps of the two provenances, but dissolving pulp of the more southerly provenances had a higher glucan content and slightly better yields and α-cellulose content in bleaching experiments. Wood increment of the more southerly provenances was at least equal to those of the northern ones, and it is concluded that seed from Central Finland can be used satisfactorily to supplement northern seed as necessary. *From authors' summary.*

377. BENZIE, J. W. **A Red Pine plantation problem in Upper Michigan.** *Tech. Note Lake St. For. Exp. Sta.* No. 524, 1958. pp. 2.

Examination of > 1400 trees in 13 *Pinus resinosa* plantations in the Ottawa National Forest, Mich., showed heavy mortality, particularly in the 5- to 9-year plantations, with a survival of 13% compared with ca. 40% for plantations > 10 years old. Survival in the younger plantations was closely correlated with seed source, less so for the older plantations. Frequent symptoms were dead branches and tops, and an unidentified canker.

378. CROW, A. B. **Early effects of local geographic seed source on planted Loblolly Pine.** *J. For.* 56 (7), 1958 (513–4). 1 ref.

In 1952, seed of *Pinus taeda* was collected from 5 provenances in Louisiana and from one in Arkansas. The seedlings were raised in Baton Rouge, and planted out in 1954 in E. and W. Louisiana, using a randomized block design with 4 replications of each seed source at each planting site. Drought killed the W. plantations in the first summer. Examination of 4th-year survival, height, and incidence of tipmoth (*Rhyacionia frustrana*) and fusiform rust (*Cronartium fusiforme*) on the E. plantation indicates no significant effects of using seed from provenances 20 to 180 miles from the planting site.

379. FUNK, D. T. **Frost damage to Yellow-Poplar varies by seed source and site.** *Sta. Note Cent. St. For. Exp. Sta.* No. 115, 1958. pp. 2.

Dieback in a 3-year-old plantation of *Liriodendron tulipifera* in Ohio after frosts in May 1957 was found to be related to seed-source, and the advantage of using seed of local provenance was demonstrated. Seedlings grown from seed from the 3 most southerly sources (Illinois, N. Carolina and Mississippi) showed a mortality (from frost and other causes) of 79–94%. Seedlings at the bottom of a N.E. slope suffered 4 times as much frost damage as seedlings on the slope above.

232.13. Trials of Hybrids and Other Products of Tree Breeding

See also section 165 and No. 372.

380. NILSSON, B. Studier av 3-åriga avkommor efter korsning svensk gran × kontinentgran. **[Studies of 3-year-old progeny obtained by crossing Swedish with 'continental' *Picea abies*.]** *Svenska Skogsv-Fören. Tidskr.* 56 (2), 1958 (225–50). 17 refs. [Sw.sw.]

Progeny of Swedish and continental Spruce and of crosses between the two were examined in 1957. The hybrid was superior to Swedish Spruce in top-shoot growth and equal in resistance to autumn, and probably more resistant to spring, frosts. It was superior or equal in growth to continental Spruce, and more resistant to autumn, and probably equally resistant to spring, frosts. Previous research by the author and other writers suggests that the superiority in growth will be maintained at least for 20–30 years. Positive correlations were found for top-shoot growth with number of surviving plants and frost damage, and a negative one with dry-matter content of the needles. Negative correlations were found for dry-matter content with number of surviving plants and frost damage. Only weak correlations were found between date of flushing and either top-shoot growth or dry-matter content. Research on the relationship between dry-matter content of the needles in the mother tree and top-shoot growth of the progeny continues.

381. RIGHTER, F. I., and CALLAHAM, R. Z. **A California planting of progenies of 'elite' and 'non-elite' *Pinus radiata* from Australia.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 135, 1958. pp. 3. 1 ref.

Progeny trials were made in 1953 of wind-pollinated seed from 5 trees (2 being élite) growing in New South Wales forests; 10 seeds from each tree were sown in each of 15 blocks. The élite seeds germinated faster than the others and after one growing season growth of progeny from one élite tree was significantly better and from the other significantly poorer than that of the other seedlings. Four years after planting out in the Berkeley Hills, Cal., the élite tree progeny had not proved superior; best height growth (5·47 ft.) was by non-élite progeny, least (5·21 ft.) by the élite progeny that had shown best nursery growth.

382. POKORNÝ, J. Pokusná plocha euro-amerických topolů na Černokostelecku. **[The**

Černokostelec experimental area of hybrid Black Poplars.] *Práce výzkum. Úst. lesn. ČSR* No. 12, 1957 (113–27). [Cz.russ.f.]

In this mountainous region, an experimental area of Black Poplars was established in 1951 at 300 m. alt. Details are given of soil conditions and of the method of planting. After casualties, 7 foreign species with several clones were available for examination. Measurements taken from 1953 to 1955 are tabulated. The first 6 years showed stock from Germany, Belgium and the Netherlands to be developing best; nothing definite could yet be said about individual varieties. The dry conditions of the trial area, however, appeared to suit clones of *P.* × *robusta*, whereas clones of *P.* × *marilandica* and *P.* × *gelrica* developed less favourably. Marked differences have been noted in rate of increment even between individual clones of the same variety; hence it will be necessary to work with individual clones in future.

383. BARNES, B. V. Erste Aufnahme eines sechsjährigen Bestandes von Aspenhybriden. **[Preliminary data from a six-year-old stand of Aspen hybrids.**] *Silvae Genet.* 7 (3), 1958 (98–102). 14 refs. [G.g.e.f.]

Measurements of d.b.h., total height, and branch angle were taken after 6 growing seasons in two seedling populations of hybrid Aspen. The crossings were carried out in 1951, using different parent sources of *Populus tremula* and *P. tremuloides*. Observations on crown form, flushing time and flowering were also made. Best performance at this age was shown by the hybrid population whose ♀ parent was a *P. tremula* from Saxony. *From author's summary.*

232.2. Preparatory Work. Auxiliary Measures

See also Nos. 345–6, 357, 468, 477, 549, 712.

384. MÉTRO, A. Techniques de reboisement dans la région méditerranéenne française. **[Afforestation techniques in the Mediterranean region of France.**] [*Docum.*] *1st Sess. Wkg. Party on Afforestation Techniques FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/TB/2-O*, 1958. pp. 7. [F.] Limited distribution.

Gives some account of pilot studies on soil preparation—subsoiling, ridging, and scarification—with the aim of developing equipment suited to local conditions.

385. PASÁK, V. Mikroklimatické poměry při zalesňování zabuřenělých holin. **[Microclimatic conditions and the afforestation of weedy, clear-felled areas.**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (2/3), 1958 (107–22). 14 refs. [Cz.russ.g.]

Describes some microclimatic investigations made in connexion with various methods of afforesting *Calamagrostis* sites. Single ploughed furrows did not create good microclimatic conditions for transplants, as the air near the soil often got hotter than in the undisturbed stand of weeds. Squares (1 × 1 m.) cleared of weeds were better, but this operation cannot be mechanized easily, and weeds soon reinvade the squares. The best method was to plough the whole area, and to sow a cover crop, e.g. lupin, between the rows of transplants, in order to reduce microclimatic extremes in summer and winter.

386. WOOD, R. F., and HOLMES, G. D. **Afforestation problems: ground preparation and planting methods.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (36–8).

Recent trials have included highly intensive cultivation, involving deep ripping and complete ploughing, in addition to several forms of the more orthodox single-furrow ploughing. It seems possible that high degrees of cultivation on compacted and impeded mineral soils may prove economic when judged in terms of subsequent crop increment. The use of the tine plough in place of the older R.L.R. type has proved very successful on southern heaths, owing to the ability of the deep-going tine point to break up pan and compacted layers in the soil profile without opening an excessively deep plough furrow. Preliminary use of a tractor-mounted rotary-type brushcutter to cut dense low growth of heather, gorse and small coppice, greatly improved conditions for ploughing, ensuring complete turnover and a solid 'lie' of plough ridges. Continued trials of the Lowther planting machine indicated that, when mounted on a tractor toolbar, it could be used successfully for planting on completely ploughed ground or for direct planting on uncultivated land provided that the vegetation was not too heavy. Planting on the ridges after single-furrow ploughing was much more difficult, but quite possible provided that the ploughing was accurate enough to allow the tracks of the tractor to ride the ridges, and that the ridge was ≮ 9 in. thick. Another successful method involved planting in the furrow, after ploughing with a double-mouldboard two-way-throw plough fitted with a central tine. This technique could be considered for some mineral soil types, and an attempt is being made to build a planting unit on to a double-mouldboard tine plough.

387. JOHANSSON, F., and NORDENHÄLL, C. H. Erfarenheter av maskinell markberedning. **[Trials of mechanical cultivation.**] *Skogen* 45 (11), 1958 (330–3). [Sw.]

Describes trials over several seasons in the Robertsfors AB's forests, Västerbotten county, of cultivation before planting or natural regeneration with combinations of different types of tractor and cultivator. Discusses the combinations best suited to different types of terrain and to areas of different sizes, and costs.

388. VALDAISKY [VAL'DAJSKIJ], N. P., and KOBLIN, A. A. Una nueva máquina forestal para desbrozar y sembrar. **[A new forest implement for clearing and sowing.**] *Montes, Madrid* 14 (81), 1958 (197–9). [Span.]

Describes two types of tractor-drawn, 'anchor-' like implements developed at the Leningrad Institute for Forest Research, used together for scarifying and clearing the soil, and simultaneously sowing tree seed in strips. The lighter implement (240 kg.) consists of a metal body in the form of a hollow,

irregular, hexagonal pyramid, having 18 small tines, with splayed and pointed ends, arranged radially round its base. Extra weights (e.g. stones) can be put into the implement, if required. The heavier implement (600 kg. including ballast) is made of 2 hollow hexagonal pyramids having a common base, round which the tines are arranged radially. A sowing unit, consisting of 2 hollow cones with a common base, hangs from the end of the heavier implement. It has 8 holes (8 mm. diam., but adjustable) arranged round the point of the lower cone, and a device for covering the seed. In work the lighter implement is towed on a chain behind a tractor, with the heavier one (with its sowing unit) ca. 1 m. behind it. The tines break up the surface crust, clear the soil of any large stones, shrubs, or loose pieces of wood remaining from fellings, and slide over any immovable objects. Seed is shaken from the sowing unit by the jolting in work. Strips 0·73–1·5 m. wide and 3 to 5 m. apart are worked, at a rate of ca. 0·7 ha./hour.

232.3. Seed, Nursery Practice, Direct Sowing

232.31. Seed

232.311. Seed Production (Seed Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also Nos. 534–5.

389. BRENDER, E. V. **A 10-year record of Pine seed production on the Hitchiti Experimental Forest [Georgia].** *J. For.* 56 (6), 1958 (408–10). 5 refs.

Seed production by *Pinus taeda* and *P. echinata* was estimated annually from 1947 to 1956 by the use of seed traps in a mature, fully stocked stand, a more lightly stocked, immature stand, a seed-tree stand, and a shelterwood stand. The total numbers of seeds and of sound seeds are compared for the different stands, and results compared with those of other investigators [cf. *F.A.* 18 No. 1495]. It is concluded that the shelterwood system will give the best results in this area, and that ground scarification will help, but only if the prospective seed crop promises to be adequate.

390. BORCHERS, K. Auswirkungen rezenter Klimaschwankungen auf die Häufigkeit von Buchen-Samenjahren in Niedersachsen. **[The effects of recent climatic fluctuations on the frequency of Beech seed-years in Lower Saxony.]** *Forst- u. Holzw.* 13 (17), 1958 (330–3). 6 refs. [G.g.]

Analysis of summer rainfall and temperatures shows that 1929–49 was a dry-summer period, and also that over the last 100 years the frequency and productivity of Beech seed-years have been ca. 70% greater in the two wet-summer periods than in the single dry one. The trend since 1950 to another wet-summer period appears to indicate a return to more favourable conditions for the natural regeneration of Beech in the area.

391. LĂZĂRESCU, C., and LĂZĂRESCU, A. Criterii de alegere a arborilor plus în culturile de larice. **[Criteria for selecting élite trees for Larch breeding.]** *Rev. Pădurilor* 1958 (2), (75–8). 5 refs. [Rum.russ. g.f.e.]

Recommends the establishment of indices for height and d.b.h., as being the most important factors; and the elimination of all trees with crooked stems.

232.312. Seed Collection, Extraction and Grading (incl. Seed Weight)

See also Nos. 355–6.

392. TICKLE, C. G. **New method of harvesting tree seed in Britain.** *N.Z. Timb. J.* 4 (11), 1958 (30–1).

Describes a method developed on an estate at Leaton Knolls, near Shrewsbury, using a climbable rope net, 40 ft. long and tapering from 40 ft. at the top to 6 ft. wide at the base. An illustration shows 3 men on the net. [Cf. *F.A.* 18 No. 3946.]

393. SNYDER, E. B., and ROSSOLL, H. **Climbing Southern Pines safely.** *Occ. Pap. Sth. For. Exp. Sta.* No. 159, 1958. pp. 17. 7 refs.

Illustrated description of tree-climbing with sectional ladders, so as to combine safety with efficiency when collecting cones etc.

394. LYLE, E. S., and GILMORE, A. R. **The effect of rough handling of Loblolly Pine cones on seed germination.** *J. For.* 56 (8), 1958 (595). 2 refs.

Seeds from roughly handled cones germinated as well as those from gently treated controls. It is concluded that any impact short of crushing unopened Loblolly cones will not affect the rate or % of germination.

395. LAVENDER, D. P. **Effect of seed size on Douglas Fir seedlings.** *Res. Note Ore. For. Lds. Res. Cent.* No. 32, 1958. pp. 8. 9 refs.

Experiments with 50 lb. of seed graded by size, indicated that size and weight of seedlings were not affected by seed size, but that heavy seed (37,000/lb.) produced ca. 50% more living 2-year-old seedlings for every seed sown than did light seed (47,000/lb.). There was no correlation between seedling mortality and seedling size.

232.315. Seed Storage and Treatment

See also Nos. 268–9, 413, 445–7, 449, 478, 701.

396. STONE, E. C. **Growth of *Pinus lambertiana* affected by seed age.** *Abstr.* in *Plant Physiol.* 32 (Suppl.), 1957 (xxv). O.R.E.

Storage of seeds retarded germination and subsequent radicle growth. Stratification eliminated the effect on germination but only partly that on growth rate. Dry storage at − 18° C. maintained the seed in a 'fresher' condition than storage at 0° or 25°.

397. BOUVAREL, P., and LEMOINE, M. La conservation par le froid des grains de résineux. **[Cold storage of conifer seeds.]** *Rev. for. franç.* 10 (7), 1958 (493–7). [F.]

Gives results of some successful experiments in cold storage of seed of *Abies cephalonica*, *A. grandis*, and *A. nordmanniana*, which normally lose their germinative capacity rapidly. After one year of

storage in sealed containers at + 4° C., they had lost > 20% of germinative capacity. Some data are also given on cold storage of *Larix decidua*, *Picea abies*, *Pinus nigra* vars. *calabrica* and *austriaca*, *P. pinaster* and *P. sylvestris*.

398. ZAHARIEV, B. J., and CONEV, V. A. Udoben metod za zapazvane na dăbovi žălădi. (Predvaritelno săobštenie). [**A suitable method of storing acorns. Preliminary report.**] *Nauč. Trud. lesoteh. Inst., Sofia* No. 5, 1957 (159–71). 7 refs. [Bulg.russ.]

Small quantities of acorns of Red Oak and *Quercus robur*, and of the fruits of Sweet Chestnut were kept over winter in perforated wooden boxes (40 × 40 × 50 cm.) in a storehouse. The boxes were lined with dry Oak leaves or dry straw, the acorns being either in one layer, or in two layers separated by more leaves or straw. The advantages of the method, including ca. 85% germination of the Red Oak from nursery sowings, are discussed. More extensive trials with these and other seeds are to be made in order to confirm the efficacy of this method.

399. SILEN, R. R. **Artificial ripening of Douglas-Fir cones.** *J. For.* 56 (6), 1958 (410–3).

Cones from 5 specimens of *Pseudotsuga taxifolia* were collected at 10-day intervals from mid-July to the end of August and stored (1) on trays in a shed at 60–80° F.; (2) between layers of damp peat moss in a cellar at 63°; and (3) in running water, at ca. 56°. When they had matured, the cones were kiln-dried at 110° max. temperature, and the seed extracted and cleaned. Germination tests showed that (2) gave better results than (1) and that (3) was the worst.

400. LAVENDER, D. P. **Effect of field stratification on Douglas Fir seed germination.** *Res. Note Ore. For. Lds. Res. Cent.* No. 33, 1958. pp. 8.

A comparison was made of seed (*a*) exposed during the winter on the soil surface on the Tillamook burn (protected from rodents by wire mesh) and (*b*) stored for 6 months at 0°, 32°, or 40–60° F. and then stratified for 6 weeks in moist sand. There was no significant difference in mean germination % between (*a*) and (*b*), but (*b*) was much more variable.

401. LØKEN, A. Frøets spiring hos sitkagran og lerk. [**Germination of Sitka Spruce and Larch.**] *Årsskr. norske Skogplantesk. 1957*, 1958 (28–35). [Nor.]

Results, given in graphs, show that stratification for 7, 15, 30 and 60 days considerably increased both germinative energy and capacity of Spruce and Japanese Larch, the effect increasing with duration of stratification. European Larch was not affected and Siberian Larch only slightly. Research continues.

402. HAGNER, S., and SIMAK, M. Stratifieringsförsök med frö av *Pinus cembra*. [**Stratification experiments with seed of *P. cembra*.**] *Norrlands SkogsvFörb. Tidskr.* 1958 (2), (227–75). 30 refs. [Sw.g.]

The seeds studied were in 2 parcels, 103F and 104F, from 2 mother trees, growing in latitude 63° 42′ and 64° 03′ N. and at altitudes 210 and 275 m. respectively. X-ray photographs were taken for part of each parcel (*a*) at intervals during stratification and for the other part (*b*) only before stratification. Seed was stratified at + 5° C., being pushed into the damp medium (sand, vermiculite or filter paper) to a depth of ¾ of its own height or else covered by the medium (sand or vermiculite) to a depth of 3–4 cm. Part of the completely covered seed was exposed to air every 4 weeks. Development was most rapid in parcel 103F, which was sown in the greenhouse in March, whereas 104F was sown in the open in May. The X-ray photographs before stratification showed considerable differences in the distribution of relative length of the embryo [R.E.L.] (as a % of the length of cavity in which it lay) and in the % of polyembryonic seed. Unstratified seed failed to germinate during 2 months after sowing, but the greater part remained sound. Parcel 103F showed little difference in germination after 60 days between (*a*) and (*b*) seed (44·4 and 45·1% respectively), unlike 104F, where differences were considerable (19·6 and 34·4%) probably rather as a result of drying out than of direct effect of the X-rays. The effects of the different stratification methods were studied on (*b*) only. Best germination results were obtained, in descending order, from: seed covered with fine vermiculite and exposed to air every 4 weeks; seed pressed down into the surface of fine vermiculite; and seed covered with coarse vermiculite throughout the period without special exposure to air; and the worst results from: seed covered with sand and exposed to air every 4 weeks; seed pressed down into the surface of filter paper; and seed covered with sand throughout the period. Mean R.E.L. before and after stratification was 55 and 84% for 103F and 43 and 67% for 104F. The progress of embryo development during stratification is discussed, and illustrated in a number of X-ray photographs. Germination was generally best from seed with the longest embryo before stratification, but a large % of these seeds had split before sowing and rotted after sowing. Germination increased with increasing R.E.L. after stratification for values > 40%; for lower values seed failed to germinate. Development and germination of polyembryonic seed was poor, and seed with poorly developed endosperm tended to rot during stratification.

Recommendations include sorting the seed by X-ray photographs before stratification; the use of a porous medium, kept moist; control of mould with tetramethyl thiuram-disulphide; sowing when the best developed seeds reach an R.E.L. of 80%; and sowing immediately on removal from the stratifying medium so that no drying-out occurs.

403. ASAKAWA, S. **Studies on the hastening of the germination of seeds of five-leaved Pines.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 100, 1957 (41–54). 16 refs. [Jap.E.jap.e.]

[Cf. *F.A.* 19 No. 329.] To accelerate germination in *P. koraiensis* and *P. pentaphylla*, two-stage stratification (months in brackets) at 25° C. (2) plus 2° (3), and in *P. pumila* simple stratification at 2° (4) are recommended. Simple stratification at 2° (3

weeks) accelerates the germination of *P. strobus*, which is unfavourably affected by two-stage stratification; light or alternating temperatures do not markedly affect its germination. Supporting experimental data are given in detail.

404. ASAKAWA, S. **Studies on the delayed germination of *Fraxinus mandshurica* var. *japonica* seeds. (6) The experiments with special reference to the effect of burying-storage on germination.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 100, 1957 (23–39 + 9 photos). 13 refs. [Jap.E.jap.e.]

[Cf. *F.A.* 19 No. 330; 20 No. 269.] Neither time of collection nor drying after collection affected the type of water-absorption curve, the growth of encased embryos and the breaking of embryo dormancy (*a*) or acceleration of germination (*b*) by stratification. A stratification temperature of 15° C. was better for (*a*) and 25° for (*b*). For the cold alternative period, 2° was better than 8°. Two-stage stratification to accelerate germination should be at 25° and 2°. Though excised embryos from non-stratified seeds can be grown to saplings, those stratified with high temperature (15°) were more vigorous and certain in growth.

405. BODEN, R. W. **Some aspects of seed dormancy in *Eucalyptus*.** *Aust. For.* 21 (2), 1957 (81–5 + 1 plate). 8 refs.

Seed of *E. pauciflora* and *E. dives*, after storage, entered into a state of dormancy that could be broken by a number of methods, the most practical being water-soaking for 48 hours. This dormancy is common in the *Renantherae* and may be confined to the group, although it is not characteristic of all species therein. The dormancy is due to some property (physical or chemical) of the seed-coat. [Cf. *F.A.* 17 No. 2544.] *From author's summary.*

406. AFANASIJEV, D. Stimulacija sjemena. [**Seed stimulation.**] *Šum. List* 82 (5/6), 1958 (163–76). 20 refs. [Croat.g.]

Presents data on experiments in seed treatment to hasten germination. Two kg. of *Acer pseudoplatanus* sown in a box in March were kept out of doors for 7 hours each day in temperatures varying from 15 to − 11° C., and indoors for 17 hours at temperatures of 17–10°. Germination began after 40 days (compared with a normal stratification period of 140 days) and rose to 92%. Height growth after 1 year averaged 27·6 cm. *Ginkgo biloba* seed kept in sand in a bag was exposed to temperatures of 30–35° for 12 hr. and of 5–10° for the remaining 12 hr. each day, i.e., the daily difference in temperature was 24°. Germination began after 18 days, and the germination % of the seeds when planted (in a box indoors) was 85. Similarly, seed of *Elaeagnus angustifolia* sown in a box and kept at a temperature of 40–45° for 7 hr. and 10–12° for 14 hr. each day, germinated after 12–16 days. Seed of *Sequoia gigantea* and *Chamaecyparis lawsoniana* was also treated with chemical solutions of (*a*) 0·5% $MgCl_2$ + 1% $MgSO_4$ for 48 hr., (*b*) 0·004% $MnCl_2$ + 0·004% $MnSO_4$ for 48 hr., (*c*) 2% ethylamine chlorhydrin for 30 min., (*d*) 50% 'phytohormone' extract for 24 hr., and (*e*) as a control, water for 48 hr. Treatment (*b*) increased the germination % of both species and favourably influenced their further development (measured after 7 months)—*S. gigantea* more than *C. lawsoniana*; (*a*) decreased the germination % of both species as compared with (*e*), favourably influenced the height growth of *S. gigantea*, but retarded that of *C. lawsoniana*; (*d*) favourably influenced both the germination % and seedling development of *C. lawsoniana*, but adversely affected *S. gigantea* on both counts. The limited nature of the experiments is stressed.

232.318. Seed Testing. Germination Tests. Seed Quality

See also Nos. 138, 270, 348, 394, 402, 534–5.

407. **International rules for seed testing. Amendments to the rules affecting forest tree species approved by the International Seed Testing Association Congress in Paris, June, 1956.** FAO, Rome. 1958. pp. 7.

Addition to 'Handling Forest Tree Seed (Part 2)' *FAO For. Developm. Pap.* No. 4 [cf. *F.A.* 15 No. 3980].

408. CHING, T. M., and PARKER, M. C. **Hydrogen peroxide for rapid viability tests of some coniferous tree seeds.** *For. Sci.* 4 (2), 1958 (128–34). 10 refs.

The test, which has been proved in the malting trade for barley, involves the removal of the outer and inner coats, at the radicle end, by abrasion or cutting, and soaking the seed in 1·0% H_2O_2 in water, the volume (ml./50 seeds), temperature in °C., and duration (days) recommended for these tests varying as follows: *Pinus contorta* 120, 20, 5; *P. jeffreyi* 150, 20, 5; *P. lambertiana* 300, 20, 6; *P. ponderosa* 300, 20, 7; *Abies* (3 spp.) 150, 20–30, 8 or 9; *Pseudotsuga taxifolia* 150, 20–30, 5. The last two genera were subjected to an alternation of 16 hours at 20° and 8 at 30°. Viable seeds produce visible radicles. Comparison with the standard germination test showed a significant correlation with $r = 0{\cdot}995$ in 22 lots including the above species. With 34 lots of Douglas the H_2O_2 test % = standard germination test % + 3·320 ± 0·901, the excess of the H_2O_2 results being probably partly covered by the sound seed left after the standard test (0–8% in the 22 lots quoted above). This test cuts out hours of soaking, weeks of moist stratification, and some alternation of temperatures, while reducing the 35–90 days' germinating period of the standard test to 5–9 days.

409. BUSZEWICZ, G., and HOLMES, G. D. **Seven years seed testing experience with the tetrazolium viability test for conifer seeds.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (142–51). 15 refs.

Reports the results of 7 years of routine testing of seed germinative capacity of 11 species, using both the standard Copenhagen Tank Germinator and the biochemical staining agent tetrazolium bromide [cf. *F.A.* 17 Nos. 1483, 3857]. The development of tetrazolium testing and the methods of carrying out the tests are described. Using the two staining classes *A* (fully stained embryos) and *B* (embryos

with $< \frac{1}{6}$ of total surface unstained) it was found that for most species $A + B$ values gave the most reliable estimate of germination, except in the case of *Abies* spp., where A values alone gave the better results. No improvement in accuracy was obtained by including data of endosperm staining. *Tsuga heterophylla*, *Pinus contorta* and *P. nigra* var. *calabrica* gave rather less satisfactory results than the other species tested.

410. JOHNSSON, H. Groningsmognad och lagringsmognad hos tidigt skördat granfrö. [**Seed maturity as assessed by viability immediately after harvesting and after storage, in Spruce seed harvested early.**] *Svenska SkogsvFören. Tidskr.* 56 (2), 1958 (213–24). 9 refs. [Sw.sw.]

The following main results were obtained from seed of 'continental' as opposed to Swedish *Picea abies*, harvested between 6 Sept. and 15 Nov. 1954 and tested immediately or after storage for periods of up to 3 years. (1) In fresh seed, germinative capacity [g.c.] had almost reached its maximum by early September; germinative energy [g.e.] reached its maximum in early October; moisture content of seed decreased until the end of September, then remained constant till early November when it decreased still further; the maximum 1000-seed weight was reached by early September and pigmentation of the seed-coat occurred in mid-October. (2) In stored seed, g.c. did not decrease significantly below its original values during storage for 3 years; g.e. decreased significantly during storage especially in the earliest harvested seed (9% after 3 years compared with original values of 50 or 79%, for seed harvested in September). Extraction of seed harvested in October was poor immediately after harvesting but satisfactory after storage for 1 month.

411. GARCÍA SALMERÓN, J. M., and BREIS, F. DEL B. Dos hongos aislados en los lechos de germinación de semillas de *Pinus halepensis* Mill. [**Two fungi isolated in germination beds of *P. halepensis*.**] *Montes, Madrid* 14 (81), 1958 (183–7). [Span.]

The mycorrhizal fungi *Aspergillus versicolor* and *A. niger* appeared 8–10 days after *P. halepensis* seeds had been left to germinate in beds of sterilized filter paper over cotton wool. The spores had evidently come from the seeds themselves. Colonies of both fungi were isolated and cultivated and descriptions and illustrations are given. The growth of *A. versicolor* appeared to inhibit that of *A. niger*.

232.32. Plant Rearing. Nursery Practice

See also Nos. 355–6.

412. MIKOLA, P. Taimitarhoojen nykyiset työmenetelmät. [**Nursery practice in Finland.**] *Commun. Inst. for. Fenn.* 48 (4), 1957 (1958). pp. 19. 15 refs. [Fi.e.*e.*]

Discusses the answers to a questionnaire sent to 150 forest nurseries in Finland, with questions on soil treatment, sowing methods, transplanting, weed control, watering, shading etc.

413. JANČAŘÍK, V. Ochrana semenáčků osiky ve školkách. [**Protecting Aspen seedlings in nurseries.**] *Práce výzkum. Úst. lesn. ČSR* No. 13, 1957 (125–48). 10 refs. [Cz.russ.e.]

Describes experiments made in 1954–55 in the nurseries of the Forest Research Institute, Zbraslav Strnady, from which the following conclusions are drawn: (1) mixing the seed with sand for sowing should be avoided, as even with careful handling the seed suffers mechanical damage. It is better to sow the pure seed on soil where brushwood has been burnt about 14 days previously and to regulate density by using some suitable dispenser. (2) Burning of brushwood on the beds before sowing favours microbiological activity, reduces acidity, increases the nutrient supply (especially of P and K), and improves the growth of the seedlings. (3) Use of Agronal (active principle phenyl mercuric bromide) as a dry seed dressing considerably reduced germination, retarded the growth of seedlings, and was followed by increased mortality during the first year. (4) Spraying with Bordeaux mixture was very effective against leaf diseases, especially the leaf-spot caused by *Venturia* (*Fusicladium*) *tremulae* and bacteria. It is necessary to repeat the spraying at 14-day intervals or after rain washing the fungicide from the leaves. Spraying with $KMnO_4$ solution also gave good results, but this fungicide is best reserved for use against soil fungi; treatment must be repeated after rain. These results were confirmed by those of trials in other localities.

414. FAULKNER, R., and ALDHOUS, J. R. **Nursery investigations.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (19–36).

Partial sterilization: Though application of neat formalin to the surface of the soil was much less effective than the standard method of watering with a diluted solution, it was found that application of neat formalin in drills $1\frac{1}{2}$ in. deep, 1 in. wide, and $3\frac{1}{2}$ in. apart gave almost as good results as the standard method. Mechanical injection of formalin or chloropicrin into the soil, using an adapted Auchencruive Injector (designed to inject D-D for control of potato eelworm) also gave satisfactory results and is cheaper than applications of diluted formalin solutions involving the transport of large quantities of water about the nursery. *Date of sowing*: Oak and Beech sown at Kennington in the autumn with an extra 4–6 in. depth of soil covering gave as good results as (but not better than) normal spring sowing, provided the extra depth of cover was removed in the spring. *Nursery treatment of Firs*: Experiments to improve the nursery technique for raising *Abies* spp. have so far indicated that stratification for 2–3 months before sowing improves germination, that autumn sowing can result in serious losses from frost (late March or April sowing being best) and that a seedbed cover of $\frac{1}{4}$–$\frac{1}{2}$ in. of grit gives the best seedling yields. *Seedbed irrigation*: Great increases in yields and in seedling growth were obtained in seedbeds irrigated by an overhead spray-line. Applications of N fertilizers in solution through the spray-line were less effective than equivalent amounts applied dry to the soil in the

normal manner. *Weed control*: A new material, 'S.1112', prepared by Shell Chemicals, was tested against the standard application of vaporizing oil as a pre-emergence weedkiller, but proved less effective. Allyl alcohol, injected into the soil undiluted, was also less efficient than vaporizing oil, though when diluted with water it gave better results. Two other chemicals, 'CDAA' (2-chloro-N,N-diallylacetamide) and 'CDEC' (2-chloroallyl-diethyl-dithiocarbamate) are also under test. It was found that CDAA was a more effective weedkiller than CDEC, but also that it damaged seedling crops of Japanese Larch and Sitka Spruce more severely. Another Shell preparation, 'S.776', was tested as post-emergence weedkiller, but was found in the concentration tested, to damage conifer seedlings. Tests with CMU as a complete weedkiller on fallow land have shown that in doses $\geqslant$ 200 g./100 sq. yd., some damage to crops raised in the following year may be expected. *Maleic hydrazide as a growth inhibitor*: Experiments in its use to defoliate 1-year seedlings [cf. *F.A.* 15 No. 3529] suggest that it has an adverse effect on growth and survival of conifer transplants, appreciable for at least 2 years after treatment. *Protection against pests*: Seed treated with Morkit (anthroquinone) and Indasco (an asphalt emulsion) together, or with Indasco alone, in some cases gave significantly fewer seedlings than untreated seed or seed treated with Morkit or red lead only. Bird damage was not reported on any plots, so the repellent effect of the treatments could not be evaluated. Aldrex 30 (30% aldrin in miscible oil) and Dieldrix 15 (15% dieldrin in miscible oil) applied in 2 gal. water/100 sq. yd., gave effective control of cutworms. *Handling of plants*: Polythene wrapping has again proved most successful for preserving plants in transit or in storage, high survivals on planting out ($>$ 80%) being obtained after 4 weeks' storage. Tests have included Corsican Pine, normally a difficult species to handle; 4 hours' exposure reduced survival to 50%, but if plants were packed in polythene, no reduction in survival on planting was found after 56 hours' storage.

232.321. Nursery Sites, including Factors affecting Selection of Sites for Nurseries

See No. 237.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also Nos. 237, 243, 413–4, 486–7.

415. **Bibliography on green-manuring for improving soil structure and fertility in the tropics (1932–1957).** *Bibliogr. Bur. Soils, Harpenden* No. 120, 1958. pp. 12. Limited distribution.

Annotated list of 69 references.

416. Stoeckeler, J. H. **Preliminary observations of perennial lupine as a cover crop in field-planting sites and forest nurseries in Wisconsin.** *Proc. Soil Sci. Soc. Amer.* 22 (2), 1958 (170–3). 11 refs. O.R.E.

On good sites, oven-dry yields of *Lupinus perennis* in the 4th year reached ca. 3500 lb./acre, equivalent to 60–73 lb. N. On poor dry sites, it was a failure. On irrigated nursery sites the mean dry weight increased between the first and third year from ca. 3200 to 12,180 lb./acre and N content/acre from 55 to 311 lb. It responded well to fertilizers. Aphids and leaf-hoppers in some cases reduced growth.

417. Faulkner, R. **Scottish experiments comparing chloropicrin with formalin as a partial soil sterilizer for conifer seedbeds.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (159–70). 7 refs.

Summarizes the results of experiments started in 1953 at a number of nurseries [cf. *F.A.* 17 No. 3860; 19 No. 342]. It was found that chloropicrin injected into nursery beds at a depth of 4 in., and at rates of 0·62–0·83 gal./100 sq. yd. (30–40 gal./acre) is usually a slightly more effective sterilizing agent than formalin, as gauged by height growth and yield of usable 1-year seedlings of Sitka Spruce. Chloropicrin must be applied $<$ 30 days before sowing, and preferably in the previous autumn. Using machines, the cost of applying 30 gal./acre came to ca. 10*d.*/sq. yd. in 1957, or ca. 1*s.* 7*d.*/1000 usable seedlings.

418. Vaartaja, O. **Treating seedbeds with the new sterilizer Mylone.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 14 (2), 1958 (3).

Describes tests with a new soil sterilizer based on tetrahydro - 3,5 - dimethyl - 2H-1,3,5-thiadiazine-2-thione, which is claimed to offer the following advantages: (1) it is a non-toxic powder when dry; (2) in moist soil it changes chemically and kills fungi, nematodes, and weeds; (3) it evaporates in a few days from warm soil and leaves no toxic residue; (4) it contains much N, which is left in the soil to act as a fertilizer. Laboratory tests proved the efficiency of Mylone against damping-off fungi. Field tests showed its herbicidal powers but no superiority in size of seedlings.

419. Palmer, J. G., and Hacskaylo, E. **Additional findings as to the effects of several biocides on growth of seedling Pines and incidence of mycorrhizae in field plots.** *Plant Dis. Reptr.* 42 (4), 1958 (536–7). A.P.B.

[Cf. *F.A.* 18 No. 3968.] An examination of the seedlings remaining in the plots for the second growing season showed that the greater growth of seedlings in the MeBr plots was partially maintained, while suppression of growth by Nemagon was still evident. Initial increased growth in plots treated with Vapam and Bedrench was not maintained. Virginia Pines were more branched and irregular in shoot growth than Slash Pines. Heavy mycorrhizal formations were found on all seedlings, including those grown in the MeBr plots from which mycorrhizae were absent in the first growing season.

420. Stone, E. C. **Fertilizers for timber trees.** *California Agriculture, Berkeley* 12 (6), 1958 (6, 15).

A brief account of greenhouse experiments with *Pseudotsuga taxifolia*, *Pinus ponderosa* and *Sequoia sempervirens* grown on different soils with and without NPK fertilizer. Differential responses to fertilizer treatment on different soils were shown by all species, the governing factor appearing to be the amounts of available Ca and Mg in the 3 soils used.

421. TSUDA, K. **[On some nitrogen manures of top-dressing. (IX) Manure examination for *Larix*.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 8, 1957 (38–45). 3 refs. [Jap.jap.e.e.]

Compares, with tabulated data, the effects of top dressing and root manuring with several organic and inorganic manures.

422. TSUDA, K. **[Manure examination for *Larix* (X). On the proper quantity of three elements affecting the growth of Japanese Larch seedlings at the Sunagawa and Kulchan nurseries.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 8, 1957 (46–53). 3 refs. [Jap.jap.e.e.]

Compares the effects of $(NH_4)_2SO_4$, Ca superphosphate, and K_2SO_4, giving tabulated data on green weight, height, dry weight, content of N, P, K, ash/dry matter, nutrients/ash, and uptake of NPK, all from various dosages of 0–21 kg./0·245 acre.

423. Gjødsling og jordforbedring. **[The use of fertilizers and soil improvement [in nurseries].]** *Beretn. Regnskap Skogbr. Skogind. ForsknForen. SkogforsknGruppe 1957*, 1958 (7–8). [Nor.]

Comparative N fertilizer trials at various nurseries have shown that the soil type affects the choice of fertilizer used to increase growth of Spruce. On newly cultivated forest soils with relatively low pH (4–4·5), $Ca(NO_3)_2$ gave the best growth (Sønsterud and Kvatninga). On old cultivated soil with medium pH (5·5–6), there was no significant difference between $Ca(NO_3)_2$, $NH_4NO_3{\cdot}CaCO_3$ and $(NH_4)_2SO_4$ (Kvatninga), while on old cultivated soil with very high pH, $(NH_4)_2SO_4$ gave the best results (Sønsterud). A readily soluble N fertilizer applied in the year of transplanting had no effect on 2 + 2 Spruce.

424. BINDIU, C., and RUBŢOV, Ş. Aspecte privind cultura ulmului in pepinierele de stepă. **[Raising Elm [*Ulmus pumila* var. *arborea*] in steppe nurseries.]** *Rev. Pădurilor* 1958 (2), (79–80). [Rum.russ.g.f.e.]

Production of first-quality seedlings was increased 33% by watering with a 0·001% concentration of DDT at 1 litre/sq.m., and 30% by watering with a 0·005% solution of 'ammonium sulphocyanide' [NH_4SCN?] at the same rate. Mulching and sowing in furrows gave no increase over controls, but provision of lateral shade, 30 cm. high, gave 16% increase.

425. HUSE, S. Forsøk med 'barstrømetoden' i norske skogplanteskoler. **[Trials of the 'needle-litter method' [of sowing] in Norwegian forest nurseries.]** *Årsskr. norske Skogplantesk. 1957*, 1958 (45–58). 10 refs. [Nor.nor.]

Describes briefly the Dunemann system [see *F.A.* 14 No. 1151] and discusses trials in 6 nurseries in E. Norway. A small-scale time-study in a 35-year Spruce plantation showed that one hour was needed to collect needles enough for 1 sq. m. of seedbed, but since conditions for collection would generally be less favourable, the possibility of using *Sphagnum* peat was studied. In the experiments seed was sown broadcast in (1) needle litter (30 cm.), (2) *Sphagnum* peat (30 cm.) and (3) ordinary seedbeds, and then covered with 3–4 mm. of coarse sand. The beds were shaded during the first part of the summer and watered when necessary. In 1954 Spruce and in 1955 Spruce and Pine were sown. (1) gave better height growth of Spruce than (2) or (3) in 1954, but in 1955 when a small amount of complete fertilizer was added to the peat, (2) gave height growth equal to (1). Weed growth was less in (1) than in (3) and negligible in (2). Pine appeared comparatively little affected by the seedbed, but height growth was best on peat with fertilizer. The study was for too short a period to be altogether conclusive.

426. SELCUK, H., and RÖHRIG, E. Biologische Grundlagen der Anzucht von Forstpflanzen in Nadelstreubeeten. **[The biological basis of the raising of forest plants in needle litter beds.]** *Forsch. u. Berat.* (*Forstw.*) *Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 3, 1958 (40–60). 7 refs. [G.]

A preliminary report on experiments at Hann.-Münden on germination, growth and nutrient uptake of various species in (*a*) Spruce needle-litter beds, and (*b*) a (not very suitable) mineral soil under similar conditions of watering and shading. In (*a*) germination was faster for all 8 species tested (considerably so for Silver Fir, Douglas Fir and Scots Pine) except European Larch, but formation of terminal buds was sometimes delayed, particularly in Scots and Austrian Pine, and Douglas Fir. Among the 4 species tested further, over one growing season, Spruce, Red Oak, and Larch, but not Alder, were superior on (*a*) in mean height, plant numbers, and dry matter production at the end of the growing season, height growth of Oak and Larch being particularly good. Root growth was less stimulated, and the dry-weight root/shoot ratio was reduced, though not seriously. Uptake of N was greater in (*a*) except for Alder, also that of K and Mn, but uptake of P and Ca was less. The fact that Alder responded less than other species suggests that N uptake may be an important factor in promoting growth in (*a*). Temperature conditions were also generally more favourable in (*a*) and weed infestation much less, indeed, negligible where a top layer of sand had been used (some beds had Beech mull). The high rate of nutrient withdrawal suggests that litter beds may need mineral fertilizers if used repeatedly.

232.323. Sowing and Covering

See also Nos. 413–4.

427. RUBŢOV, S., *et al.* Aspecte privind metode de cultură a ulmului in pepiniere. **[Nursery practice for Elm.]** *Rev. Pădurilor* 1957 (12), (772–6). 3 refs. [Rum.]

Sets out in graphs and a table the results of experiments in rates of sowing and spacing of seedlings of *Ulmus foliacea* and *U. pumila* var. *arborea*, the object being to raise 1 + 0 or 2 + 0 planting stock for steppe planting.

428. LAFOND, A. **The production of tree seedlings by hydroponics.** *Pulp Paper Mag. Can.* 59 (6), 1958 (204–5).

Galvanized pans, 42 × 21 × 4 in. (capacity 3000

seedlings), were varnished inside, the bottom covered with 1 in. of 0·5-in. gravel, then filled with sifted coarse river sand, and set outside. Sowings should be made in Quebec before 20 May and covered during germination with a polythene sheet. A complete nutrient solution, containing micronutrients and a higher % of NH_4 salts than usually accepted in agriculture, was supplied and drained over a minimum slope by gravity. The pH was adjusted daily to 4·5–4·7 since values > 5 resulted in enormous damping-off losses developing within a few hours of germination. Salt toxicity due to evaporation was avoided by adding water to the solution which was circulated without change for 15 days. Seedling production (Norway and Black Spruces and Jack Pine) almost equalled germination capacity, at a cost probably lower than for nursery plants. Norway Spruce grew 4–6 in., with a root system 3–5 times that of nursery stock, in one summer; 1000 of these seedlings planted in poor ground with strong grass competition showed < 3% deaths at 12 months.

232.324. Transplanting and Lining Out, including Grading of Seedlings

429. FLEISCHER, E. Maschinelles Pflanzenheben durch Pflanzenhebepflug 'Graupa'. **[Mechanical lifting with the 'Graupa' plant-lifting plough.]** *Forst u. Jagd* Spec. No. *Die Pappel II*, 1957 (43–5). [G.]

Describes operations with a tractor-drawn plough in Poplar nurseries, including working costs. It is claimed that even heavy soils are loosened sufficiently for easy lifting, and that roots suffer fewer injuries than with manual work.

430. FAULKNER, R. **Summer, autumn or spring lining out?** *Scot. For.* 12 (3), 1958 (127–34). 6 refs.

The %s of usable transplants (i.e. a plant > 3 in. tall, and with at least ⅓ of it bearing healthy needles) in the 2½–3½ and 3½–4½ in. height classes were determined for first- and second-year Scots Pine and Sitka Spruce lined out in 5 different nurseries in the N. of Britain from mid-May to early Oct., and from early March to early April. With both species, 3½–4½ in. plants produced proportionately more usable transplants than the 2½–3½ in. class at all lining-out periods. June and July lining out gave a high yield of usable transplants, and compared favourably with March, the usual period. Lining out in late autumn gave the lowest numbers of usable transplants.

431. BØRRESSEN, E. Litt om en foreløbig undersøkelse over forholdet mellom sommer- och vårpriklede furuplanter. **[A preliminary study on the relationship between Pine plants transplanted in summer or in spring.]** *Årsskr. norske Skogplantesk. 1957*, 1958 (59–61). [Nor.]

In Oct. 1957, 2 + 0 Pine transplanted in Aug. 1956 looked more robust, and had greater mean top, root and plant weights and top and root lengths than those transplanted in spring 1957; all differences except root length were significant. Mortality was no higher with the August transplanting.

232.325. Tending (in both Seedbeds and Transplant Beds)

See also Nos. 414, 677.

432. TEÄR, J. Om ograsbekämpning: skogsplantskolornas nysådder av gran och tall med dinitrobutylfenolalkanolaminsalt. **[Weed control with dinitrobutyl phenol alkanolamine salt in newly-sown Pine and Spruce in forest nurseries.]** *Skogen* 45 (11), 1958 (328–9). [Sw.]

Experiments in 1955 and 1956 [see *F.A.* 18 No. 3978] are summarized. In 1957, (*a*) dinitrobutyl phenol alkanolamine salt in concentrations of 0·6, 0·9 and 1·2 ml./sq. m. applied 1 week after sowing, and (*b*) mixtures of (*a*) and dichlorpropionic acid were used; (*b*) was unsuccessful against *Poa annua*, *Equisetum arvense* and *Agropyron repens*, possibly because of heavy rain soon after application. The number of Spruce plants, compared with untreated control plots, was generally unaffected by the 2 lower applications of (*a*) but Pine plants were reduced by both 0·9 and 1·2 ml./sq. m. The mean reduction in the number of weeds was 50–70%, but results varied considerably between nurseries, according to the % of resistant species (*Poa annua*, *Agropyron repens* and *Equisetum arvense*) present and the stage of weed growth. The cost of the chemical is ca. Kr.75/ha.

232.326. Salvage of Overgrown Seedlings and Transplants. Root or Shoot Pruning etc.

433. ASIDDAO, F., and JACALNE, D. V. **Response of Mahogany [? *Swietenia macrophylla*] seedlings to underground root pruning.** *Filipino For.* 9/10, 1958 (117–9).

Root pruning was done with a spade inserted at an angle of 45° and a distance of 15 cm. from the row of seedlings, so as to sever the primary root and some vigorous lateral roots. Seedlings root-pruned at 1 month developed significantly heavier and more ramified root systems during the 2 months following treatment. Root-pruning at 2 months also produced improved root growth, but on balance the earlier treatment was better.

232.327. Protection Measures in Nurseries

See also Nos. 413–4, 424, 702.

434. ROBAK, H. Dekking med trespilematter mot oppfrost i frøsengene. **[The use of wooden-slat covers to prevent frost heaving in seedbeds.]** *Årsskr. norske Skogplantesk. 1957*, 1958 (22–6). [Nor.]

Results of preliminary experiments with 1-year *Picea abies*, *Larix decidua* and *L. sibirica* at Stend in winter 1956–57 showed that covering the beds reduced mortality from frost heaving, results being more conclusive for Spruce than for Larch.

232.328. Vegetative Propagation

435. HERRMANN, S. Zum Wachstum vegetativ vermehrter Bäume. **[The growth of trees produced by vegetative propagation.]** *Naturwissenschaften* 45 (8), 1958 (195). 9 refs. [G.] O.R.S.

Preliminary results (to be reported in detail elsewhere) show that growth differs from that of seedlings of the same age and resembles the pattern of

trees of the age of the tree from which cuttings or grafts were made. Some examples for 8-year-old Spruce from cuttings from parents of different ages are cited.

436. CORREIA, C. A. DA PAIXÃO. Propagação vegetativa do sobreiro. I. Ensaios com aplicação de fitohormonas sintéticas. **[Vegetative propagation of Cork Oak. I. Trials with synthetic growth regulators.]** *Publ. Serv. flor. aqüic. Portugal* 23 (2), 1956 (207–69 + 11 plates + 1 tbl.). 52 refs. [Port.port.f.e.]

Presents the results of experiments made during the period 1953–56. In (1), air-layering was used on branches of young (2- to 3-year-old) trees, and on coppice shoots that, though younger, were more vigorous than the former. Material was ring-barked with removal of the cambial tissues, and a synthetic growth-regulator in lanolin applied to the wound. In (2), growth-regulator and vitamin treatments were given to cuttings already severed from the parent plant. In (1), trials made in June and July with I-naphthylacetic acid and IAA, especially at the lower concentration tested (0·25%), promoted root growth. Of the 7 growth substances tested in May and June, only the two mentioned above and indole-3-butyric acid and 2-naphthoxyacetic acid were effective. 2,4-D also promoted root growth, but was more dependent on degree of concentration. Spring treatments were more effective than summer ones. With the older material, the lower concentrations were more successful than the higher. The influence of natural auxin and anti-auxin levels in the material is discussed in relation to root-forming capacity and to the toxic effects of 2,4-D, 2,4,5-T and 2,3,5-tri-iodobenzoic acid. In (2), in an uncontrolled environment, I-naphthylacetic acid, IAA, indole-3-butyric acid and indole-3-propionic acid applied in aqueous solutions had no effect on rooting, even when vitamins B_1, B_2, B_6 and C were added. *From author's summary.*

437. MATTHEWS, J. D., and MITCHELL, A. F. **[Vegetative propagation of Japanese Larch.]** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (64).

Cuttings of Japanese Larch, taken in July from parent trees 11–16 years old, were inserted in a sub-irrigated frame with electrically warmed soil. Two rooting media were compared and the effects of removing the terminal ½ in., 2 in., and 3 in. from the cuttings on the incidence of *Botrytis cinerea* and on rooting were tested. The best combination of treatments, giving 48% rooting, was an equal mixture of sand and peat as rooting medium and removal of the terminal ½ in.

438. PATTON, R. F., and RIKER, A. J. **Rooting cuttings of White Pine.** *For. Sci.* 4 (2), 1958 (116–27). 13 refs.

Treatments were continued [see *F.A.* 12 No. 2669] in outdoor beds of builders' sand over gravel, some with bottom heating and all with overhead sprinklers. All cuttings were from the most recent season's growth. Control cuttings were from 2 + 2 transplants, their % rooting (which varied with the year of planting, 1949–56, from 30 to > 90) being the criterion of the 'rooting year'. Treatment with growth regulators, chiefly indole-butyric acid, was standard. Bottom heat increased rooting in good, but depressed it in bad, years or when injurious treatments were applied. No single treatment with various sugar or N sources consistently improved rooting of cuttings from older trees. Air-layering of 60-year trees or their 15-year grafts was unsuccessful. Several of 10 clones (of both graft and seedling origin) tested showed extreme variation in rooting ability over the 4 years, and this was uncorrelated with similar fluctuations in the controls, possibly indicating cyclic phases in the tree's rooting response. Cuttings from trees originating from cuttings were consistently superior in rooting ability to those originating from seedlings, until the parents were 9 years old, from which point the rooting ability was equalized. In lieu of carrying late summer cuttings through the winter out of doors, the storing of later winter cuttings in polythene bags under refrigeration, and planting in early spring appears likely to give maximum rooting. [Cf. *F.A.* 17 No. 2738.]

439. ZMIJANAC, Đ. Proizvodnja sadnica goleme sekvoje. **[Producing planting stock of *Sequoia gigantea*.]** *Šum. List* 82 (5/6), 1958 (177–85). 2 refs. [Croat.e.]

A short description is given of *S. gigantea* in its natural habitat and as an exotic in Zagreb and its environs. The easiest method of propagation in the experience of the author is to take stem cuttings from 1- to 3-year-old seedlings. The species is recommended for introduction in the mountainous regions of Jugoslavia.

440. ENRIGHT, L. J. **Propagation of several species of *Acer* by cuttings.** *J. For.* 56 (6), 1958 (426–8). 10 refs.

Rooting experiments with *Liriodendron tulipifera*, using indole-butyric acid [cf. *F.A.* 19 No. 2947], were extended to *Acer* spp. Cuttings of *A. campestre*, *A. ginnala*, *A. griseum*, *A. palmatum*, *A. platanoides*, *A. rubrum*, *A. saccharinum* and *A. saccharum* were taken, and the method and materials used to treat them are described in detail. Results show that dipping in concentrated solutions of indole-butyric acid increased the rooting %, reduced the time required for rooting, gave a greater root length and density, and extended the period during which cuttings could be propagated.

441. SHAPIRO, S. **Auxin control of seasonal polarization of root emergence.** *Abstr.* in *Plant Physiol.* 32 (Suppl.), 1957 (xlii). O.R.E.

Describes experiments on stem cuttings from Lombardy Poplars maintained in humid darkness [cf. *F.A.* 17 No. 214]. Cuttings from dormant trees produced root primordia along their entire length, but cuttings from trees breaking dormancy showed a pronounced polarization, until finally roots emerged only at the base of the cuttings. With return to dormancy, this polarization disappeared, and auxin [not specified] applied to cuttings from actively growing trees in various concentrations removed it, without inhibiting root growth.

442. SPÎRCHEZ, Z. Inmulţirea prin marcotare a unor specii forestiere de arbori şi arbuşti. **[Experiments in air-layering some forest tree and shrub species.]** *Rev. Pădurilor* 1958 (2), (84–90). 7 refs. [Rum.russ.g.f.e.]

Gives tabulated data on experiments with *Viburnum opulus*, *V. lantana*, *Euonymus verrucosus*, *E. europaeus*, *Ligustrum vulgare*, *Staphylea pinnata*, *Cornus sanguinea*, *Sorbus aucuparia*, *Sambucus nigra* and *Prunus padus*.

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

See also No. 357.

443. KARSCHON, R. **The production of Eucalypt plants in containers (preliminary note).** *Leafl. Dep. For. Israel* No. 4, 1958. pp. 4.

A variety of containers was tested. The best preliminary results with 5-week-old *Eucalyptus rostrata* after ca. 6 months were obtained with earthenware or concrete pots. Large black polythene bags proved good and smaller bags are now being tested. Plants in tar-paper tubes were of poor quality, probably because mineral tar inhibits root growth.

444. BINDIU, C., RUBŢOV, S., and TOPOR, D. Contribuţii privind mărirea productivităţii pepinierelor de frasin prin aplicarea stimulenţilor. **[Increasing the productivity of Ash nurseries by the use of stimulants.]** *Rev. Pădurilor* 1957 (12), (768–72). 8 refs. [Rum.]

Experiments were made in fine weather in June, 1956, on Ash sown the previous autumn in nursery beds. The substances used were α-naphthylacetic acid and 2,4-D (Na salt) at 100 and 50 mg./litre respectively, applied as foliar sprays or to the roots, on fertilized and unfertilized plots. All treatments gave increased height, diameter growth and survival, particularly the combination of fertilizer and growth regulator. Higher rates of application to foliage caused anomalous growth.

232.33. Formation of Stands by Direct Sowing

See also Nos. 271, 357, 359, 388, 478, 487, 746.

445. WOOD, R. F., and HOLMES, G. D. **Protection of direct sown seeds.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (42–3).

Experiments were made in order to find an effective dressing for direct-sown Pine (especially *Pinus radiata* and *P. pinaster*) seed, that would repel mice. Of the compounds tested, actidione killed nearly all seeds, and TNB-A (trinitrobenzene aniline) depressed germination. No compound gave complete protection against mice, but WRL 2 (a chlorinated hydrocarbon) and TNB-A gave seed survival rates of 35 and 22·5% respectively under conditions where untreated seeds showed 15% survival.

446. WAGG, J. W. B. **Spot seeding Ponderosa and Jeffrey Pine.** *Res. Note Ore. For. Lds. Res. Cent.* No. 35, 1958. pp. 19.

A 10-acre area was disk-ploughed and sown with tetramine-treated seed of *Pinus ponderosa* and *P. jeffreyi* in spots spaced 4 × 8 ft. apart. At the end of the second growing season 41% of spots contained ⩾ 1 live seedlings (538 stocked spots/acre). Drought appeared to be responsible for death of 26·5% of all seedlings and other factors for another 27·7. Rodents were not an important cause of loss to tetramine-treated seed. Common errors in spot sowing were sowing too deeply or sowing in depressions holding free water.

447. **Direct seeding methods.** *Timberman* 59 (8), 1958 (36–8).

The Crosby Chemical Co. of DeRidder, La., sow Longleaf Pine direct on cultivated strips, which reduces the grass stage from 4–10 years to 3. The rate of treatment with bird repellent per 100 lb. seed for hand sowing for (*a*) Longleaf and (*b*) Loblolly and Slash, is 25 lb. sublimed anthraquinone. For aerial and tractor sowing 15 lb. Arasan (50% thiram) or Arasan-75 is substituted. Where rodents are present 1 lb. endrin is added for (*a*) and 2 lb. for (*b*). Dilution rates for stickers, by volume in water, are for (*a*) only Flintkote asphalt emulsion 1/3; for (*b*) the same, 1/2, or for (*a*) and (*b*) Dow latex 512-R, 1/9.

448. LEAK, W. B. **A one-piece cylindrical screen for protecting seedlings.** *J. For.* 56 (8), 1958 (592). 1 ref.

Describes wire-gauge screens and how to make them. An improved variant of earlier cylindrical screens, they are better than the conventional conical type.

449. LAVENDER, D. P. **Seeding dates and Douglas Fir germination.** *Res. Note Ore. For. Lds. Res. Cent.* No. 34, 1958. pp. 15. 3 refs.

Results of experiments with Douglas Fir seed sown on the Tillamook Burn area at intervals from Nov. to late March, showed that field germination was highest for seed sown in Nov. and Dec. Storage temperatures (0°, 32°, and 40–60° F.) did not affect field germination; stratification increased germinative energy but not germinative capacity.

450. MORARIU, T. Semănături directe cu ghindă în rînduri pe tăblii. **[Direct sowing of acorns in rows on prepared patches.]** *Rev. Pădurilor* 1958 (3), (135–8). [Rum.russ.g.f.e.]

Gives results, with tabulated data on costs, of a comparative trial of (*a*) planting, (*b*) nest sowing, and (*c*) line sowing, all on prepared patches in afforestation areas. Costs/ha. (in lei) for establishing were (*a*) 2974, (*b*) 2359 and (*c*) 1638. The reduction of 31–45% in costs of (*c*) was due partly to reduced tending costs.

451. HAUN. Kalkdüngungsversuch zu Buchelsaat. **[Liming trial with Beech sowings.]** *Allg. Forstzeitschr.* 13 (30), 1958 (424–5). [G.]

Reports on small-scale trials with drill sowing after soil preparation and application of various dosages of CaO or $CaCO_3$ in a 144-year stand in the Palatinate where natural regeneration had repeatedly failed. Five years after sowing, plant numbers on limed plots were 3–4 times those on plots without lime, and mean heights were also greater. There was little difference between plots with different liming treatments.

232.4. Formation of Stands by Planting

See also Nos. 355–7.

232.41. Planting Stock (Type, Handling and Treatment)

See also Nos. 414, 464–5.

452. CHEN, C. W. **[Experiments in planting out *Casuarina equisetifolia*.]** *Bull. Taiwan For. Res. Inst.* No. 51, 1956. pp. 12. 9 refs. [Chin.]

Reports results in 1956 of a small, statistically controlled experiment started in 1949, in which 1440 nursery stock (1 + 0) were put out near the coast on a "sticky" soil, pH 6·35, under the following treatments: plants entire, branches cut to ⅓ of their length, taproot shortened to 16 cm.; 20- and 30-cm. spacings; vegetable compost or night-soil added [no dosage stated]; controls. Plants branch-cut developed nearly 50% better than those with shortened taproot, save when both received fertilizer: both fertilizers improved growth; other variables yielded inconclusive results. Of the 9 references, 7 are Chinese.

453. **[A method of packing and storing single seedlings.]** *Unasylva* 12 (1), 1958 (47–8).

The plant roots, with a handful of moist sphagnum or brown peat moss, are placed on a piece of oilskin paper and rolled into a cylinder 1 in. in diam. This is put in a 2-in. polyethylene tube, the bottom of which is folded to prevent the moss from spilling. The excess width of the polyethylene tube is folded with a sharp edge and fastened with a rubber band. The plants thus packed are watered and kept [to enable them to form a well developed root system] for at least a year. For planting, the tube is removed and the tree planted with the moss. Several species have been kept in this way for up to 5 years; the plants were healthy but retarded in growth. During the storage stage [in boxes or heeled-in], they can be watered with nutrient solution, or sphagnum treated with nutrients can be incorporated into the package.

454. WILNER, J., and VAARTAJA, O. **Prevention of injury to tree seedlings during cellar storage.** *For. Chron.* 34 (2), 1958 (132–8). 10 refs.

Survival of planting stock after cellar storage during the winter in Saskatchewan was consistently good when the storage method included packing the roots in damp peat. *Acer negundo* and *Ulmus americana* needed such protection more than *Caragana arborescens* and *Fraxinus pennsylvanica* var. *lanceolata*. Pre-storage treatments with fungicides increased survival only slightly or were injurious. It was demonstrated that injurious desiccation of stored plants may be determined by electrolytic methods.

232.42. Methods of Planting (including Use of Fertilizers etc.)

See also Nos. 386, 452, 477.

455. STIELL, W. M. **A planting experiment method with White Spruce.** *Pulp Paper Mag. Can.* 59 (6), 1958 (207–8). 2 refs.

A statistical comparison, appraised at 3 years from planting, was made of (*a*) saddle, (*b*) half-saddle and (*c*) wedge planting, using a straight-bladed spade, in an old field. In (*a*) two and in (*b*) one shallow (4-in.) soil wedge was removed and the roots spread down the slopes (in (*b*) from halfway down the single slope). In (*c*) a deep (9-in.) wedge was cut and the roots spread against the vertical face. In all cases the wedges were replaced and tamped down. Choice appears to lie in the order (*c*), (*b*), (*a*) for the conditions obtaining at Petawawa.

456. **Deep planting seems best for Slash Pine.** *Rep. Stheast. For. Exp. Sta. 1957*, 1957 (4).

Survival of *Pinus elliottii* seedlings, particularly of small ones, on difficult sites in the South Carolina sandhills was greatly increased by planting deep, so that only the bud remains above ground.

457. POURTET, J., and TURPIN, P. L'influence de la profondeur du plan d'eau et du travail du sol sur la croissance des peupliers. **[The influence of depth of water-table and of soil cultivation on the growth of Poplars.]** *Rev. for. franç.* 10 (6), 1958 (415–8). [F.]

Comparison of growth of *Populus* × *euramericana* 'I-214' on a plot where the water-table was at a depth of 1·5–2 m. during most of the year, showed the great superiority of those plants located in slight depressions (ca. 0·55 m. below the general level) over those at the general level—m.a.i. in the 6th year 55 cm. and 9 cm. respectively, mean girth in 6th year 55 cm. and 32 cm. It is recommended that on sites with a relatively deep water-table, Poplars should be planted in holes 0·8 m. deep, and the soil ploughed and disked to assist capillary rise of moisture.

458. OKON, E. U. **The effect of rice bran as a fertilizer/mulching agent.** *Rep. Dep. For. Res. Nigeria 1956/57*, 1958 (26).

Height measurements on two adjacent ½-acre plots of young *Gmelina arborea* on poor soil in grassland, one year after the application of a mulch to one of them, showed mean heights of 3·3 and 6·3 ft. respectively on the control and the treated plots.

459. SORIANO LLORET, A. Ensayos de plantación de resinosas y binas de las mismas con máquina y tiro de sangre. **[Conifer planting and weeding trials with animal-drawn implements.]** *Montes, Madrid* 14 (81), 1958 (191–6). [Span.]

[Cf. *F.A.* 18 No. 2732.] Describes an ox-drawn planter and an A-hoe, used in trials in very hilly country. Results so far are promising, and the trials are to be continued.

232.43. Spacing and Arrangement in Plantations

See also Nos. 477, 498, 988.

460. SMITH, J. H. G. **Better yields through wider spacing.** *J. For.* 56 (7), 1958 (492–7). 28 refs.

A review of literature on thinning, pruning, and initial spacing regimes for Douglas Fir.

461. BECKING, J. H. Het plantverband voor populieren-opstanden. **[Plant spacing in Poplar stands.]** *Ned. Bosb. Tijdschr.* 30 (8), 1958 (241–3). [Du.]

Presents tabulated figures showing basal area,

d.b.h., height, and volume/ha. for plantations of *Populus* × 'serotina erecta' 5–12 years old, spaced at 4 × 4 and 4 × 8 m., and calculates figures for volume, and value per ha., with and without planting costs, at 12 years for spacings of 4 × 4, 4 × 8 and 8 × 8 m. The value of plantations spaced at 4 × 4 and 4 × 8 was roughly the same after planting costs had been deducted, but the 4 × 4 spacing is better, as regards properties of the final timber, since there is more opportunity for selection in thinning; in addition the thinnings provide pulpwood. The 8 × 8 m. spacing gave values Fl.900/ha. lower than the other two, a difference that could not be offset by growth in later years.

462. PIERLOT, R. La méthode Anderson de boisement en groupes espacés: son application au Congo Belge. **[The Anderson method of afforestation by spaced groups: its application in the Belgian Congo.]** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (573–82). 5 refs. [F.] [Cf. *F.A.* 17 No. 1536.]

463. DAVIES, H. **[The effect of differences in spacing of *Pentaclethra macrophylla*.]** *Rep. Dep. For. Res. Nigeria 1956/57*, 1958 (8–9).

Three years after planting, plots spaced 4 × 4 ft. had closed canopy; plots at 8 × 8, 15 × 15, and 24 × 24 ft. were still far from closed and were consequently suffering from competition from herbaceous weeds.

232.44. Season and Time of Planting

464. HUSS, E. Om höstplantering av tall och gran. **[Autumn planting of Pine and Spruce.]** *Skogen* 45 (16), 1958 (450–4). [Sw.sw.]

Summarizes results (to be published in detail elsewhere) of trials in Sweden in 1951–53 comparing the results of autumn and spring planting, and establishing the methods, kind of stock, and sites and date of autumn planting giving the best results.

465. BELITZ, G. Über die Anwendbarkeit der Sommer- und Herbstpflanzung bei der Kiefer. **[The feasibility of summer and autumn planting of Scots Pine.]** *Arch. Forstw.* 7 (2), 1958 (113–29). 21 refs. [G.g.russ.e.]

[Cf. *F.A* 16 No. 2903.] Seedlings ⩽ 1 year old can be successfully planted from spring to autumn. Survival is best in the spring, very uncertain in the May–August plantings, and good in the autumn, the method of handling having a basic influence at all planting seasons. The later in the year a 1-year seedling is planted, the poorer its height growth in succeeding years, and these plants are completely unsuitable for summer and autumn planting. Height growth in succeeding years of seedlings of < 1 year shows no distinct dependence on planting season. Their performance is practically the same as that of spring-planted 1-year seedlings of the same provenance. Summer and autumn planting of Scots Pine is feasible, if seedlings < 1 year old are carefully planted in damp soil, in favourable weather. To take advantage of the October root growth, they should be planted not later than the beginning of that month.

233. Afforestation

See also Nos. 8, 50, 52, 74, 76, 384–8, 521, 1290.

466. KIERULF, T. Plantningene på Horta. **[Plantations on Horta.]** *Tidsskr. Skogbr.* 66 (2), 1958 (109–12). [Nor.]

Cites, from accounts in 1900–01, planting carried out at 760–1000 m. alt., and summarizes the position today. *Picea engelmannii* has given good results at 970 m.

467. MUTCH, W. E. S. **High elevation forest margins.** *Scot. For.* 12 (3), 1958 (147–54). 5 refs.

Reports on a visit to Norway in 1954, to examine conditions (particularly stand structure and regeneration) at the upper limit of natural forest, as a basis for the treatment of margins of artificial forests in Scotland. The stands visited were Scots Pine/Birch at Tingvoll, Spruce/Birch/Scots Pine at Hirkjølen, and Spruce near Voss. The first two stands are described in detail. Norwegian and other continental evidence suggests that it may be advisable to devote some land at the upper limit of Scottish plantations to stands to be managed for protection. Birch, *Alnus incana*, Larch, Rowan and Spruce are good trees for margins, Pine is not. Spaced group planting of the protection zone appears to be a good way of creating the margin, though trials will be necessary to find the best structure.

468. MRÁZ, K., and LOCHMAN, V. Zhodnocení zalesňovacích způsobů podle lesních typů. **[Results of different methods of afforestation in connexion with forest types.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (2/3), 1958 (151–63 + 1 tbl., 2 sets of gphs., 2 sets of dgms.). 12 refs. [Cz.g.]

An inventory was made on sites where clear-felled areas in the *Piceetum relictum*, *Molinio-Quercetum*, *Pineto-Quercetum*, and *Tilio-Abietum* had been reforested with notch-planted young Pine, Larch, Oak, Red Oak, Lime or Alder. Tabulated results are given and include the influence of: (1) site on plant growth and plantation costs; (2) choice of tree species on plantation success in the individual forest types; (3) different methods of soil preparation, and tree mixtures.

469. LOWRY, G. L. **Conifer growth and survival varies on acid spoils.** *Ohio Farm and Home Research*, *Wooster* 43 (311), 1958 (20–1).

Shows, in diagrammatic form, total height and survival % at 2 years on 5 different types of soil (pH varying from 2·1 to 7·3), for *Pinus strobus*, *P. rigida*, *P. banksiana*, *P. echinata*, *P. ponderosa*, *P. resinosa*, *Juniperus virginiana* and *Chamaecyparis thyoides* in Ohio. *P. rigida* was the most consistently promising. [Cf. *F.A.* 20 No. 50.]

470. HASSENTEUFEL, W. Die Pflanze als Bodenfestiger. **[Plants as soil stabilizers.]** *Forstwiss. Cbl.* 77 (5/6), 1958 (129–38). [G.]

Discusses generally the causes of failure of vegetation to establish itself naturally on steep, bare slopes; the choice of plants, including trees, for stabilizing such slopes; and the optimum time and methods of planting.

471. OLIVEIRA, J. A. LINCE DE. Arborização florestal em solos pouco evoluidos. [**Afforestation of poorly developed soils.**] *Agros* 41 (3), 1958 (191–206). [Port.]

Deals with regosols, non-saline alluvial soils, lithosols and lithosolic soils, defining the main characteristics of each, and recommending, in general terms, measures to be used in afforestation.

472. MÉTRO, A. Méthodes de plantation au Maroc. [**Methods of establishing plantations in Morocco.**] *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (533–8). 5 refs. [F.]

Deals mainly with the technique of Eucalypt planting in Morocco.

473. NAIR, K. N. R. **Techniques of artificial regeneration and formation of plantations.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (547–51). [E.]

Describes the establishment of plantations of *Evodia roxburghiana*, *Ailanthus malabaricum*, and *Sterculia campanulata*, to provide match stock in Madras.

474. DAS, E. S., and CHAND, B. **Experimental afforestation of bare, dry and rocky slopes in high hills.** *Indian For.* 84 (7), 1958 (402–6). 3 refs.

The object of the experiment was to afforest sites at 7000 ft. alt. in the Punjab (mean annual rainfall 44 in., with a marked dry season; frost and heavy snowfall in winter). Both indigenous and exotic species were planted, in winter as well as during rains. *Cedrus deodara* did well on the better soils. *Cupressus torulosa*, *C. arizonica*, and *Pinus ponderosa* gave excellent results. Tube planting of *Pinus sylvestris* and *P. taeda* gave a high % of survival. Coniferous species succeeded only when planted at the beginning of the rainy season. Only light weeding is indicated, as some degree of weed cover protects young trees from sun and drought. Other species that were tried but failed were *P. nigra*, *P. patula*, *P. pinaster*, *Pseudotsuga taxifolia* and *Cryptomeria japonica*.

475. LAMBA, G. S. **Desert control.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (583–9). 6 refs. [E.f.]

With special reference to Indian deserts.

476. BELLOUARD, P. Le contrôle du desért en Afrique occidentale. [**Desert control in [French] West Africa.**] *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (590–7). [F.]

477. BACKER, M. DE. Étude sur le problème du reboisement des régions montagneuses denudées autour du Graben africain. [**The afforestation of denuded mountains of the African Rift.**] *Bull. agric. Congo belge* 49 (3), 1958 (715–67). 5 refs. [F.du.]

[Cf. *F.A.* 15 No. 248.] Demographic and economic data for 3 chiefdoms in Kabare (population 300,000 on 320,000 ha.), E. Belgian Congo, justify the planting of 50,000 ha. (out of 60,000 degraded) which with an annual production of 15 cu.m. (24 stere/ha.) should meet the one stere/man/year minimum required for fuel and construction by the growing population. Planting methods tried are: (*A*) partitioned contour trenches, 0·7 m. deep × 0·8 m., set at 6-m. horizontal intervals (h.i.) and partitioned every 4·5 m. by soil, 0·5 m. wide and 0·6 m. deep. Prepared at the beginning of the previous rains, these continuous trenches receive wash from above and from the spoil below but are still ca. 30 cm. deep, when trees are planted in them, 1 m. apart, in the following rains; (*B*) trenches 2 × 0·3 × 0·3 m. separated by 0·3 m. along the contour and 2-m. h.i., are dug the previous dry season or small rains, and 2 or more plants set during the following rains on the spoil below each trench; (*C*) individual terraces 2 × 2 m. at 5-m. centres, quincunx; the cut (worked with a pick) and fill (spoil) form a counter-slope of 10% on which 2 and 5 plants, respectively, are set during the following rains; (*D*) trenches as for (*C*), but with terraces 4·5 m. long × 1·1 m. wide, are separated by baulks 0·5 m. wide along the contour. Trees planted on the spoil form continuous lines at 4-m. h.i. Five such lines are separated by a line of (*A*) on very steep slopes. The cost of (*A*), the best for silviculture and soil protection, would be justified only near very important markets. (*B*), also costly, is suited only to special conditions. (*C*), effective silviculturally and for anti-erosion, is the cheapest. (*D*), also cheap, has brought under afforestation areas hitherto considered too steep, and is useful for line sowings, e.g. of Black Wattle. The cost/ha. including plants, planting headmen and European supervision etc. on slopes of 55 and 75% in thousands of francs is respectively (*A*), 11·24 and 12·32, (*B*) 11·15 and 12·22, (*C*) 5·12 and 5·61, and (*D*) 5·35 and 5·87. Wages are reckoned at Fr.20 man-day and European supervisor at 1/300 of annual salary/ha. Data on earth moved, water retained, area worked for infiltration, plants/ha. and tasks in man-days are tabulated and the various effects of slope described.

478. SAN BUENAVENTURA, P. **Reforestation of 'cogonales' in the Philippines.** *Filipino For.* 9/10, 1958 (28–33).

Describes the methods used in afforestation of *Imperata* grasslands (> 23,000 ha. afforested to date). *Leucaena glauca* sown broadcast at the start of the rainy season on previously burnt grassland, is the most rapid way of eradicating *Imperata*. Sowing from a helicopter proved unsuccessful, but was tried only on unburnt land. Further trials are to be made after burning. Treatment of *L. glauca* seed by soaking in hot water results in germination in 3 days vs. 4 days for controls; seedlings/sq. m. after 13 days were respectively 5 and 7.

235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also Nos. 316–7, 340–1, 345–7, 360, 467.

479. BARAŃSKI, S. Wyniki przemiany składu gatunkowego drzewostanów sosnowych w nadl. Ożarów. [**Results of changing the species composition of the Pine forests in the area of the Ożarów forestry superintendent.**] *Sylwan* 101 (9), 1957 (17–33). 5 refs. [Pol.russ.e.]

Beech, Silver Fir and Oak were introduced in 1933–37, Beech by planting, Fir and Oak by sowing,

into pure Pine stands on site classes I and II, planted in 1900–06. An examination of the understorey on 154 ha. in 1955 showed satisfactory survival on 82 ha. and < 4500 plants/ha. on the remainder. In 1954 the majority of the Fir plants in damp areas fell in the range 1–2·5 m., some individuals reaching 3·5 m. Oak was damaged by cattle, despite their official exclusion from the area; individual trees reached heights of 4 m. Beech showed satisfactory height growth—up to 8 m.

480. OLIVER, J. C. C. **The formation and management of a mixed hardwood-conifer crop.** *Quart. J. For.* 52 (3), 1958 (178–82).

Discusses, from first-hand knowledge, an Ash/Larch stand planted in 1935–36 in Montgomeryshire, Wales. Japanese Larch did better than European (top height at 20 years, respectively 50 ft. and 40 ft., mortality 10% and 75%), and appears likely to dominate the Ash. European Larch is dominated by the Ash and the result is a more satisfactory mixture.

481. MENSBRUGE, G. DE LA. Enrichissement de la savane de la Haute-Côte-d'Ivoire—introduction de teck. **[Enrichment of the Upper Ivory Coast savanna—introduction of Teak.]** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (312–21). [F.]

The savanna woodland in this area is the result of fire, and the essential condition of its improvement is fire exclusion. The Teak plantations described are protected by living firebreaks of *Gmelina arborea*, are thinned every 5 years from 6–8 years onwards, and need no further tending. The ultimate object is to introduce indigenous species under the Teak and restore something like the original forest cover.

482. GAUCHOTTE, M. Note sommaire sur la sylviculture de l'Okoumé. **[The silviculture of *Aucoumea klaineana*.]** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (503–21). [F.]

Describes in some detail the technique of 'enrichment' by line planting or sowing of *A. klaineana* in the forests of Gabon, with some discussion of development and tending of the stands thus created.

483. FAYS, E. P. DE, and HUYGEN, J. P. Enrichissement des forêts ombrophytes hétérogènes dans la province orientale du Congo Belge. **[Enrichment of the heterogeneous rain forests in the eastern province of the Belgian Congo.]** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (235–44). [F.]

The methods employed consist in exploitation for timber and firewood, followed by line planting of desirable light-demanding species of rapid growth, lines being spaced 20 m. apart.

236. Care of Regeneration or Plantations in the Initial Stages of Establishment

See also Nos. 459, 494, 569, 673 *et seq.*, 703.

484. STACKELBERG, S. VON. Motorisierte Kulturreinigungsgeräte. **[Power equipment for weeding plantations.]** *Forstarchiv* 29 (6), 1958 (135–9). 3 refs. [G.]

Describes, with technical data, portable power equipment of German and American make for weeding plantations: the Waldwiesel F600, the Stihl, and the Skysaw, each comprising a rotary weed-cutter, a circular saw, and a chain saw (for removing or cross-cutting stems of > 20–30 cm. diam.), the Waldwiesel F300 (a smaller version of the F600) and the Brushking.

237. Amelioration of Forest Sites

See also Nos. 52, 255, 359, 451, 458.

485. MAYER-KRAPOLL, H. Kalk-(Dünger-) Streu- und Stäubegeräte. **[Lime (fertilizer) distributors and dusters.]** *Forstarchiv* 29 (7), 1958 (167–8). [G.]

Tabulates technical data and data on performance and costs for equipment of German make: 'Burco', 'Wald-Rotina' and 'Harder' for distributing lime or fertilizers, and the 'Silvanus', and 'Orkan' dusting apparatus.

486. Sondernummer: Düngung von Waldboden. **[Special number: fertilizing forest soils.]** *Allg. Forstzeitschr.* 13 (10), 1958 (121 . . . 151 + 4 plates). 77 refs. [G.]

Comprises papers on: Knowledge of soil and plant physiology as a basis for mineral fertilizing in forests, and ways of determining nutrient requirements (*W. Wittich*); The consequences of fertilizing on silviculture and management, explained with examples from the bunter sandstone region of the Württemberg Schwarzwald (*K. Hasser*); The planning and demonstration of fertilizer treatments in forestry (*Kirschfeld*); Thoughts on forest fertilizing (*E. Schairer*) [covering the behaviour of fertilizers in the soil, and their uses for maintaining or improving soil condition]; Forest fertilizing from the air (*K. Oedekoven*); Forest soils for fertilizing (*E. Mückenhausen*) [with annotated illustrations of soil profiles]; Nutrient supply and fertilizing on farm and forest soils (*Mayer-Krapoll*); Forest soil fertilizing and harmful fauna in the crowns (*H. Oldiges*) [describes experiments showing that fertilizer applications resulted in increased larval mortality and decreased egg production in *Lymantria monacha* and *Bupalus piniarius*]; Liming with N-fertilizing in the forest? (*R. Themlitz*); A fertilizer trial on Douglas Fir (*E. Schairer* and *H.-U. Moosmayer*); Experiences with the Silvanus lime blower (*Kaul*); Boron for frost protection (*V. Beltram*); Iron deficiency causing chlorosis in forest plants (*S. Schönhar*).

487. Forstdüngung. **[Forest fertilizing.]** *Forst- u. Holzw.* 13 (16), 1958 (289–319). Many refs. [G.]

A special number which includes the following papers: The importance of fertilizing in forestry (*W. Wittich*); No increase in wood production is possible without ensuring nutrient supplies (*H. Mayer-Krapoll*); The effect of lime on raw-humus soils near the coast (*Jüttner*); Liming trials with Poplars (*Rüger*); Soil cultivation and fertilizer application to promote the progress of regeneration in Spessart (*Göpfert*); Helping Beech natural

regeneration by fertilizing with gaseous NH_3 (*Stier*); Phosphate fertilizing in forestry (*S. Gericke*); N-fertilizer trials in old Fir stands (*Huchler*); N-fertilizer trial in a seed orchard (*R. Kleinschmit*); The protective effect of forest fertilizing against harmful insects (*E. Merker*).

488. DUCHAUFOUR, P. L'utilisation des engrais en forêt. **[The use of fertilizers in the forest.]** *Rev. for. franç.* 10 (6), 1958 (378–92). 30 refs. [F.]

A review of literature, including methods of ascertaining nutrient deficiencies in the soil, application of complete fertilizers, liming, injection of N in gaseous form, and the combination of fertilizer and silvicultural treatment, growing of lupins etc.

489. WOOD, R. F., and HOLMES, G. D. **Improvement of checked plantations.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (39–40).

At Wilsey Down, Cornwall, trials started in 1953 on checked Sitka Spruce planted in 1934 and 1948 showed striking responses to recent manuring. Broadcast application in 1954 of a compound fertilizer containing P and K increased shoot growth on checked trees more than tenfold as compared with controls. Growth response was found to increase with rate of application of the fertilizer up to 12 cwt./acre, the maximum rate tested. Factorial experiments designed to segregate the effects of P and K were laid down in 1955, and so far indicate that the growth responses are almost entirely due to P. The duration of the effect is now being observed; at 3 cwt./acre and over, there was no falling off in the third year. Heather, dwarf gorse and grass, which are the main components of the vegetation, show no appreciable response to the dressings. Experiments were laid down in 1956 to determine the effect of manuring and vegetation control on 3 Pine plantations in check in dense heather on Wareham Heath. So far there is no indication of growth responses to superphosphate broadcast in 1956, but spraying with 2,4-D has given almost complete kill of heather with negligible damage to the Pine.

490. PALUDAN, F., and RAFN, J. P. E. Müllers gødningsforsøg i rødgran i Gludsted plantage: tilvækstforhold og trametesangreb. **[P. E. Müller's fertilizer experiments with Norway Spruce in the Gludsted plantation: increment and attack by *Fomes annosus*.]** *Forstl. Forsøgsv. Danm.* 25 (1), 1958 (63–78). 6 refs. [Dan.dan.e.e.]

[Cf. *F.A.* 16 No. 3132.] Describes the original experiment laid out in 1904, and the position after thinning in the winter of 1955–56. Application of lime after trench ploughing appeared to have had no effect on height growth; K and P may have increased it slightly but only by about 4–5% of the total growth during the period of the experiment. Comparison with a neighbouring area suggests that the fertilizers have had no more effect than that obtained by planting an admixture of *Pinus mugo* with the Spruce. Of the trees removed in thinning, 5–14% were attacked by *F. annosus*. Attack on the treated plots ranged from 10·8 to 14·3% compared with 4·9% on the controls.

491. VIRO, P. J. Eräitä metsämaan lannoituskokeita. **[Forest fertilization trials.]** *Metsät. Aikak.* 1958 (5), (151–6). 4 refs. [Fi.e.e.]

Presents results of trials begun in 1911–18. All areas were burnt over and the fertilizers [P or Ca] added before planting. In Pine, on strongly podzolized soils poor in basic minerals, Ca stimulated increment; the stimulus to diameter increment was of short duration but the lead has been maintained, that to height growth was slow but of long duration and that on volume increment is still increasing. Volume on limed stands was on average 26 cu.m. (37%) higher than that of unlimed stands. Increment on Pine and Larch stands responded positively to small amounts of bone meal, and in other Larch stands to small amounts of lime, but as there were no replications results must be treated with reserve. *From author's summary.*

492. BERG, E. Gjødsling av skogsmyrer. 15 års erfaringer. **[Application of fertilizers to wet forest peatlands. Results of 15 years' experience.]** *Skogeieren, Oslo* 45 (5), 1958 (171–7). [Nor.]

[Cf. *F.A.* 13 No. 2126.] Results of draining and fertilizer experiments in Norway are discussed and illustrated by photographs. They show that applications of a complete fertilizer for 2 successive years at the rate of 50 kg./dekare give satisfactory results. With higher rates, luxuriant grass growth hindered regeneration, and with lower rates, or with application of $Ca(NO_3)_2$, there was an immediate response in tree growth, which was, however, not maintained.

493. BECHTOLD. Eine Probedüngung zu Roteichen. **[A trial with fertilizers on *Quercus borealis*.]** *Allg. Forstzeitschr.* 13 (23), 1958 (334). [G.]

A mixture of basic slag and K applied to part of a backward 3-year-old plantation grown from 1-year seedlings on very poor, dry dune sand near Mannheim (1 tablespoon/plant) greatly increased vigour, growth and foliage. After two further applications the stand, at 7 years, is ca. 4 m. high. The few surviving untreated plants are poor.

494. GILMORE, A. R., and LIVINGSTON, K. W. **Cultivating and fertilizing a Slash Pine plantation: effects on volume and fusiform rust.** *J. For.* 56 (7), 1958 (481–3). 11 refs.

In an old-field plantation of *Pinus elliottii*, cultivation and light application of NPK fertilizer during each of the first three growing seasons resulted in an apparent, but not significant, increase in pulpwood volume of ca. 10% after 19 growing seasons. There was, however, a significant increase in the number of trees with stem cankers of *Cronartium fusiforme*. Planting of cotton between rows, with rather heavier fertilizer applications, gave a further increase in volume of ca. 10% without a further increase in stem cankering, resulting in a significant difference of ca. 21% compared with the control plots.

495. PAWLUK, S., and ARNEMAN, H. F. **The residual effects of lime added for the growth of various conifers in Minnesota.** *Proc. Soil Sci. Soc. Amer.* 21 (6), 1957 (653–5). 8 refs. O.R.E.

Applications of lime before planting, at rates

from 4 to 20 tons/acre to a sandy brown podzolic soil at the Cloquet Forest Experiment Station, had no noticeable effect on the height growth of *Pinus resinosa*, *P. banksiana*, *P. strobus*, and *Picea glauca*, over a period of 18 years. Residual effects on soil pH varied with dosage and lapse of time. With the heavier applications, pH remained higher for longer in the upper horizons.

496. Cosack, J. Die Verwendung von Müllkompost in der Forstwirtschaft. [**The use of compost from town refuse in forestry.**] *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 3, 1958 (149–57). [G.]

Describes chiefly trials near Düsseldorf [cf. *F.A.* 18 No. 4053] including later growth results, confirming the favourable effects, particularly of the higher dosages, on Pine, and reports on pot experiments with Spruce by Wittich [cf. *F.A.* 19 No. 2995] using various types of compost including compost treated with gaseous NH_3, which in many cases caused losses through excessive N concentration.

497. Koch, W. Von französischer Pappelwirtschaft. [**Poplar growing in France.**] *Allg. Forstzeitschr.* 13 (7), 1958 (78–9). [G.]

A brief illustrated report of a study tour, including a description of the sewage disposal farm of Rheims, in which the water from the city sewers, including factory effluents, is used to irrigate a Poplar plantation of 115 ha., begun in 1929, which shows a mean annual yield of ca. 14·5 cu.m.·

238. Timber Plantation Crops requiring Special Treatment

See also Nos. 461, 497.

498. Lavezzini, A. Come disporre le pioppelle negli impianti razionali. [**The rational lay-out of Poplar plantations.**] *Ital. agric.* 95 (6), 1958 (321–30). [It.] E.M.B.

Discusses spacing and lay-out (e.g. single rows, rectangular, quincunx etc.) illustrated by photographs, diagrams, and tables giving distances between plants and rows for different lay-outs.

499. Lella, E. F. di, and García, J. J. M. Producción y comercialización de maderas de Salicáceas en el Delta de Paraná. [**Production and marketing of Poplar and Willow in the Paraná Delta.**] *Rev. Invest. for., B. Aires* 1 (3), 1957 (45–178 + 6 plates). 18 refs. [Span.]

The area planted with Salicaceae in the Paraná Delta totals ca. 98,000 ha., mainly established by private enterprise. These forests provide most of the material required for the packing-case industry. The demands of the packing-case, paper and other forest products industries depending on this region call for an annual cut of 4200 ha., whereas it is estimated that 8% of the total area could be exploited annually, i.e. 8000 ha./year. The problem of adjusting supply and demand is the basis of this study. Points reviewed and discussed are (1) the raw material, i.e. species grown and the condition of the stands, (2) the characteristics and properties of the timber, (3) methods of exploitation used in the Delta, (4) transport (chiefly by river), loading and unloading, (5) marketing, (6) primary conversion and grading, (7) forms of contract for buying and selling, and prices, (8) standardization, with some proposed norms, (9) markets and the setting up of chambers of commerce and depôts for the storage and marketing of timber that has no immediate sale. [Cf. *F.A.* 16 No. 1312.]

500. Rüger, R. Anzucht und Anbau von Baumweiden. [**Nursery and plantation management of tree Willows.**] *Allg. Forstzeitschr.* 13 (15), 1958 (209–13). 8 refs. [G.]

A general account, containing information on the best species, propagation, fertilizing, sites, management, mixtures with Poplars, protection etc.

24. Tending of Stands and Trees

See also No. 837.

241. Cleaning

See also No. 569.

501. Loycke, H. J. Die Ringelung von Protzen und Zwieseln im angehenden Stangenholz der Rotbuche. [**Girdling wolf trees and forked trees in young, pole-sized Beech.**] *Forst- u. Holzw.* 13 (12), 1958 (217–22). [G.g.]

Various tools and methods were used to girdle 19- and 20-year normal, wolf, and forked Beech in April, July and Oct., 1954. Measurements were made of the time taken with the different tools and methods. Frilling at b.h. was the most successful method, then band girdling (bark and some sapwood) and making 3–4 girdles close together. Recommendations on treatment and subsequent supervision are made, and labour requirements per ha. estimated.

242. Thinning

See also Nos. 140, 218, 316, 460–1, 870, 872.

502. Boggess, W. R. **Growth and third thinning yields in a 21-year-old Shortleaf Pine plantation in Southern Illinois.** *For. Note Ill. agric. Exp. Sta.* No. 79, 1958. pp. 4. 4 refs. [Cf. *F.A.* 14 No. 3368.]

503. Carr, S. B. **Growth increase in young Redwood stands after thinning.** *J. For.* 56 (7), 1958 (512). 1 ref.

In 1953, three 1-acre sample plots were laid out in a 77-year Redwood stand. On one plot (*a*) no cutting had been done; on (*b*) ca. $\frac{1}{3}$, and on (*c*) ca. $\frac{1}{2}$ of the trees $\geqslant$ 11 in. d.b.h. had been felled in 1951. The % increase in volume in the 4-year period from 1953 to 1957 was 9·9% on (*a*), 10·5% on (*b*), and 18·5% on (*c*).

504. Conover, D. F. **Early thinnings have increased forking in a northern hardwood stand.** *Tech. Note Lake St. For. Exp. Sta.* No. 532, 1958. pp. 2.

An 11-year-old stand of American Elm and Sugar Maple in N.E. Wisconsin was thinned in 1938, removing all trees (*a*) within 2½ ft. of the crop trees and again in 1947 within 5 ft., (*b*) within 5 ft. and again in 1947 within 7 ft., Each treatment plus a control was applied to four ½-acre plots. After 19 years,

volume of (*b*) was 1370 bd. ft./acre compared with 850 bd. ft./acre on the controls, but 42% Sugar Maple and 66% Elm > 5 in. d.b.h. forked below a height of 1½ log-lengths compared with 25% and 46% for the controls; the % of forking in (*a*) was intermediate. Lighter thinning appears to be better for the production of clear sawlogs, but results of pruning studies [see *F.A.* 19 No. 3013] indicate that heavy thinning together with pruning of potential forks (to a 2-in. diam.) may produce clear logs.

505. KOIVISTO, P. Koivikoiden kasvatuksesta ja tuotoksesta. [**The thinning and yield of Birch stands.**] *Metsät. Aikak.* 1958 (3/4), (88, 91–3). 8 refs. [Fi.e.*e.*]

Summarizes results of a study on the development of managed stands of *Betula verrucosa* and *B. pubescens*. Development of the former was much more rapid, the difference being most marked in the production of veneer logs. Recommendations for thinning *B. verrucosa* from below, especially on *Oxalis-Myrtillus* sites, include (1) early thinning from ca. 20 years; (2) heavier thinning from 35–40 years, when diameter growth is accelerating as a result of thinning, and mean b.a. is about 16–17 sq.m./ha.; (3) a gradual lengthening of the thinning interval from 3 to 10 years. Maximum rotation appears to be 70 years, because of increasing rot. Tabulated figures show the standing volume and amount removed in thinning for different assortments and compares the volume of sawtimber, pulpwood and fuelwood for Birch, Pine, and Spruce at different ages. The volume of veneer logs from *B. verrucosa* is considerably below that of sawlogs from coniferous stands, and because of the low stumpage price of Birch fuelwood, the financial yield of Birch is also much smaller. The yield of dry matter in tons/ha. at 80 years is, however, similar for Birch and the two conifers. *From author's summary.*

506. ARNSWALDT, H. J. VON. Wege zu kontrollierter Leistungssteigerung in vorratsarmen Buchenwäldern. [**Methods of attaining a controlled increase of yield in low-density Beech forests.**] *Forstarchiv* 29 (4), 1958 (73–81). 21 refs. [G.g.]

[Cf. *F.A.* 15 No. 1355.] From an examination of German and Danish yield tables the author concludes that where young and middle-aged Beech stands are heavily thinned to favour the crowns of the best trees, these stands will have a greater increment and give a net production of valuable timber 20–30 years earlier than if lightly thinned. For regeneration the author recommends the open stand system [*Lichtungsbetrieb*] which gives a satisfactory value increment even with a stocking of 30–50 mature trees per ha.

507. CHROUST, L. Vliv výchovných zásahů na dubovou tyčkovinu. [**The effect of thinning on pole stands of Oak.**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (2/3), 1958 (165–84). [Cz.russ.]

Three plots, (1) crown-thinned, 30 × 40 m., (2) thinned from below, 30 × 40 m., and (3) control, 20 × 40 m. were established in a stand of 20- to 25-year naturally regenerated Oak that had been tended by the Schädelin method. After 5 years it was found that treatment (1) had, and (2) had not, improved the quality and constitution of the stand. B.a. increment on (1) was 113%, and on (2) 97%, of that on (3).

243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See also Nos. 501, 679.

508. ROACH, B. A. **Heavy 'thinning' is poor practice in mature Shortleaf Pine.** *Sta. Note Cent. St. For. Exp. Sta.* No. 116, 1958. pp. 2. 1 ref.

A 90-year-old Pine stand in Kentucky with a b.a. of 95 sq. ft. on 84 trees/acre was thinned in 1948 to a b.a. of 52 sq. ft. on 43 trees/acre, i.e. removing ca. 40% of the volume. Growth of the residual stand by 1956 to a b.a. of 61 sq. ft. with a m.a.i. of 45 bd. ft./acre was not considered sufficient to justify the heavy thinning. In addition, the openings in the stand encouraged the development of hardwood underbrush which prevented the establishment of Pine reproduction.

509. SHEPHERD, K. R. **Some aspects of ring barking in Alpine Ash forests.** *Aust. For.* 21 (2), 1957 (70–5 + 2 plates). 3 refs.

Discusses the advantages and disadvantages of girdling overmature trees and the influence on the stand of old seed-trees in *Eucalyptus delegatensis* and *E. delegatensis*/*E. dalrympleana* associations in Bago State Forest, New South Wales. In general, if a constant programme of girdling is maintained over one felling cycle, the influence of overmature and useless trees will cease within 40 years, during which period the girdled trees will gradually disintegrate; they begin to fall within 10 years of girdling. To eliminate the possibility of mechanical damage, useless trees should be girdled immediately after fellings and before seedling establishment.

510. DAVIES, H. [**The effect of removing overhead shade by poisoning emergents of uneconomic species in areas regenerated by the Tropical Shelterwood System.**] *Rep. Dep. For. Res. Nigeria 1956/57*, 1958 (8).

Assessment of the experiment showed that poisoning had been 100% effective, and also revealed some disadvantages of the method: (1) damage to growing stock caused by the falling of complete trees and large branches of trees that had been poisoned; (2) the increase in *Calamus*, *Acacia*, and climber tangles, which saplings have difficulty in penetrating; (3) 'forced' height growth in certain economic saplings (notably *Entandrophragma* and *Khaya* spp.) causing considerable distortion of the bole. The advisability of complete removal of the overstorey is questioned.

511. [**Poisoning of *Excoecaria agallocha*.**] *Rep. For. Dep. Fiji 1957*, [1958] (7).

E. agallocha is a hindrance in management of Mangrove forest since its sap may cause conjunctivitis or dermatitis. Spraying a 1-ft. wide band on the bark with 2% Trioxone (2,4,5-T) in dieseline has been found to kill all trees of this species.

245. Tending of Trees, Pruning etc.

See also Nos. 460, 719.

512. BOCKMAN, R. E., and ROE, E. I. **Effects of pruning on the form growth of a Red Pine plantation.** *Tech. Note Lake St. For. Exp. Sta.* No. 533, [1958]. pp. 2.

A 20-year Red Pine stand (8 × 8 ft. spacing) was (*a*) pruned in 1934 to 10 ft., ca. ½ total height, (*b*) left unpruned. The trees of (*a*) were pruned again after 3 and after 10 years (to leave 22–25 ft. clear out of 37 ft. total height). After 16 years, pruning appeared to have had no influence on the diameter quotient of the first 12 ft. of the bole. The mean diam. of (*b*) was ca. ½ in. greater between 2 and 12 ft. above ground than that of (*a*), and the b.a. at d.b.h. 17% more. This difference in growth is largely attributed to the removal of much of the live crown during pruning [cf. *F.A.* 19 No. 4012].

513. SALWÉN, N. Synpunkter på kvistningens ekonomi vid kvistning av tall. **[Economic aspects of pruning *Pinus sylvestris*.]** *Svenska Skogsv-Fören. Tidskr.* 56 (2), 1958 (201–12). 11 refs. [Sw.sw.]

Presents figures for the estimated increase in value of timber as a result of pruning and for pruning costs, concluding that, in favourable conditions, pruning will be economic, and that if trees are planted at 1·7 × 1·7 instead of 1·5 × 1·5 m. the decrease in planting costs will offset the cost of pruning. Other advantages of pruning are briefly discussed.

514. SIMPFENDORFER, K. J. **Pruning saws.** *Aust. For.* 21 (2), 1957 (104–16 + 1 plate). 3 refs.

Presents the results of trials to determine the most suitable type of pruning saw for use in Victorian coniferous plantations, and gives details of the 2-handed tension-blade saw recommended.

515. NORTH, C. P., RYAN, G. F., and WALLACE, A. **Maleic hydrazide tested on Ivy.** *California Agriculture, Berkeley* 12 (6), 1958 (7, 15).

Experiments indicate that clipped hedges, shrubs etc. can be maintained in shape without further pruning during a growing season if, after a first clipping, they are periodically sprayed with MH-30 or MH-40 (diethanolamide salt solution, 30 or 40% maleic hydrazide). Tabulated data are given showing effective and damaging concentrations for a number of shrubs. Limited tests indicate that MH-30 is compatible with some insecticides—DDT, diazinon, and low concentrations of malathion; high concentrations (> 25%) of malathion seemed to nullify the effect of MH-30.

25. Treatment of Defective, Derelict or Very Open Stands

See also No. 339.

516. MILLER, A. D. **Derelict woodland investigations.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (48–51 + 2 photos).

Notes are given on performance and operating costs for several machines used for scrub clearance, all powered by crawler tractors: (1) a grubber blade designed to remove root systems; (2) the 'Sabre' cutter, a circular saw mounted on a hydraulically controlled boom in front of a small tractor; (3) the 'Fleco' tree cutter, a horizontal cutting blade fixed to a 35–45 draw-bar h.p. tractor and using its momentum to chisel through the scrub stems at ground level; (4) the Anchor chain, a heavy chain 100–150 ft. long dragged through the scrub between two tractors driven on parallel courses 15–20 yd. apart; (5) the V-blade scrub cutter (the most promising device so far, a substantial blade shaped rather like a snow plough, but with sharp, horizontal cutting edges fitted at the bottom of the structure. The advantages and performance of this last machine are described at some length, illustrated by photographs of it in action.

517. HILTON, N., TYLER, G. H., and WARD, J. T. **The reclamation of derelict woodland for agricultural use.** *Tech. Rep. Minist. Agric., Lond.* No. 1, 1957. pp. 32 + 1 tbl., 8 photos.

This report examines the costs of reclaiming a number of derelict woodland sites in Hampshire and estimates the returns from farming the reclaimed land. In all cases the initial job of preparing the site for normal farming operations was done by contractors. Two systems of reclamation are considered. In method *A* the equipment generally consisted of one or more heavy bulldozers and a heavy bush plough, while method *B* involved specially designed machinery together with the use of explosives to crack the larger stumps before removing them from the soil. For the purpose of study, the work of reclamation was divided into 4 phases, each of which was costed separately: (1) clearance of tree stumps > 1 ft. in diam.; (2) clearance of trees and bushes < 1 ft. in diam. but up to 30 ft. high; (3) removal of roots and small wood from the soil and the final preparation of the site for normal farming operations; (4) collection and disposal of rubbish. Analysis of returns from 57 reclaimed sites shows that reclamation of derelict woodland can be a most profitable undertaking, particularly where the existing fixed equipment and regular labour force on the farm is sufficient to deal with the additional acreage without impairing efficiency on the rest of the holding. *From authors' summary.*

26. Combinations of Forestry with Agriculture and Pastoral Husbandry. Irrigated and Floodland Forests, Shelterbelts etc., and their Treatment

261. Alternate Forestry and Agriculture, Periodic or Temporary Agricultural Use of Forest Land

518. **Bibliography on fallowing for improving soil fertility in the tropics.** *Bibliogr. Bur. Soils, Harpenden* No. 121, 1958. pp. 4. Limited distribution.

Annotated list of 17 references.

262. Fuel and Fodder Forests

519. STANNARD, M. E., and CONDON, R. W. **Further fodder trees and shrubs of Western New South Wales.** *J. Soil Conserv. Serv. N.S.W.* 14 (1), 1958 (73–83). 3 refs.

Gives data on the distribution, habit, mortality and regeneration, and fodder value of: *Acacia pendula*,

Flindersia maculosa, *Atalaya hemiglauca*, *Ventilago viminalis*, *Owenia acidula*, *Capparis mitchellii*, *Pittosporum phillyraeioides*, *Acacia excelsa*, and the shrubs *Cassia eremophila*, *Dodonea viscosa*, and *D. attenuata*.

263. Irrigated Forests. Forests Subjected to Flooding or Seepage (*Auewald*)

520. MOHAN, N. P. **Methods of formation of plantations [in the Punjab]: irrigated and non-irrigated.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (522–32). 9 refs. [E.f.]

Mainly an account of the irrigated plantations, with some notes on the vegetation types of the Punjab.

266. Shelterbelts, Windbreaks

521. KOLDANOV, V. JA. Oblesenie stepej našej rodiny. [**The afforestation of the steppes of the U.S.S.R.**] *Priroda, Moskva* 47 (5), 1958 (31–8). [Russ.] A.P.B.

A semi-popular account, with special reference to the shelterbelt programme. Where failures have occurred, the two main causes are considered to have been the nest method of sowing (now largely abandoned), and failure to tend the young plants.

522. ČERNIKOV, F. S. Temperaturnyj režim svetlo-kaštanovoj suglinistoj počvy Ergenej v pole i pod lesnoj polosoj. [**Temperature regime of light-chestnut clay-loam soils of the Ergeni hills in a field and under a shelterbelt.**] *Počvoved.* 1958 (4), (67–73). 8 refs. [Russ.russ.e.] A.P.B.

In 1951–54 soil temperatures were measured to a depth of 4 m. at ½-m. intervals under a 20-year-old Oak/shrub shelterbelt 20 m. wide and in a field of cereal crops, in the Ergeni hills. The region has a severe continental climate and the predominating soil type is light-chestnut clay-loam. Under the shelterbelt the soil showed lower maximum temperatures in summer and higher minimum temperatures in winter, particularly in the top 50 cm. where the daytime temperature in June, July, and August was 20° C. lower than in the field; at deeper levels this difference fell to 1–4° but was still apparent at a depth of 4 m. The cooler temperature under the shade of the trees does not increase the moisture entering the rooting zone in the soil, but does reduce evaporation from the soil.

523. NAEGELI, W. **Report to the Government of Israel on shelterbelts and windbreaks.** Expanded Technical Assistance Programme, FAO, Rome. *FAO Report* No. 586, 1957. pp. 27. Limited distribution.

Reviews experiments already made and suggests further tests on shelterbelts of *Cupressus sempervirens* to determine the shelter effects of var. *pyramidalis* and var. *horizontalis*, and on elephant grass; study of wind conditions in mountain regions; the influence of shelter on crops not hitherto considered as requiring it, e.g. groundnuts, and study of wind conditions in the Negev.

524. PRAKASH, M. **The green walls of protection.** *Indian For.* 84 (6), 1958 (334–40). 10 refs.

A short general account of the theory and practice of shelterbelt planting, with lists of recommended trees for Indian conditions.

525. TAMATE, S., *et al.* **[Experiment on model windbreak. (3rd Report). Effect on salty wind. II.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 100, 1957 (55–82). 8 refs. [Jap.jap.e.*e.*]

[Cf. *F.A.* 15 No. 286; 17 No. 3970.] The first part of the study, carried out on the seashore with models made of *Cryptomeria* and Pine tops, and observations of the salt caught on cotton gauze, showed that, though the catch increased with the width of the windbreak, this was due mainly to checking of wind speed. The second part, carried out along lines crossing actual windbreaks at right angles show that the Cl content of the soil is very much greater under the windward trees, exceedingly low under the leeward trees, and little higher in the leeward field.

526. KASHIYAMA, T., *et al.* **[Wind-tunnel study on sand-arresting effect of embankment.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 101, 1957 (199–214 + 11 photos). 13 refs. [Jap.jap.e.]

Investigates the probable efficacy of an embankment planned in tiers of 3, 6 and 10 m. to protect farm land. Mean sand-grain radius and sp. gr. were 0·33 mm. and 2·64 respectively. Threshold wind velocities for sand movement were 5·9 and 6·9 m./sec. at 0·2 and 1 m. above ground. Wind-velocity profiles are given to show the effect of embankment height at each of the 3 stages. Observations were supported by others on the seashore where wind velocity several times a year reaches 20 m./sec. It is concluded that where only one row of embankment can be made, the bank should be as high and as near to the beach line as possible and a windbreak at least 10 m. high with a dense crown should be planted on the leeward of the ridge.

268. Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.

See No. 285.

28. Husbandry of Forest Products Other than Wood

527. KHAN, A. H. **Studies on growth and cultivation characteristics of medicinal and other economic plants under semi-temperate conditions.** *Pakistan J. For.* 7 (4), 1957 (319–69).

An account of experimental plots laid out at Abbottabad in 1951, with detailed notes on the various species raised.

281. Christmas Trees

528. SOPPER, W. E., and DENNISTON, J. H. **Production and marketing of Christmas trees in central and northeastern Pennsylvania.** *Progr. Rep. Pa. agric. Exp. Sta.* No. 187, 1958. pp. 8.

529. QUIGLEY, K. L., and MITCHELL, G. H. **Ohio-grown Christmas trees—production and marketing.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 152, 1958. pp. 17. 5 refs.

282. Bark Crops

See also Nos. 222–3, 369, 1328.

530. STOJANOV, V., and KOEV, D. Košničarskata vărba kato iztočnik za dobivane na dăbilni materiali.

[***Salix viminalis* as a source of tannin material.**] *Nauč. Trud. lesoteh. Inst., Sofia* No. 5, 1957 (175–81). 2 refs. [Bulg.russ.]

Investigations in Bulgaria on *S. viminalis* growing on dry, medium and wet sites, showed that on dry sites the tannin content of the bark was slightly less and its quality rather better. The % of tannin decreases from May to Aug., but its quality increases. Harvesting in May from 3-year plants of good stock growing on wet sites is recommended; some 50,000 3-year trees/ha. of 308 cm. mean height and 2 cm. mean diam. would yield ca. 40 cu.m. of wood and 2400 kg. of bark (air-dry).

531. FIGUEROA, P., and LOBO, M. Politiques subéricoles dans les pays producteurs: Espagne. **[Cork-growing policy in the producing countries: Spain.]** [*Docum.*] *4th Sess. Wkg. Party on Cork Oak FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/LG/2-Aa*, 1958. pp. 9. [F.] Limited distribution.

A general account of the history, present state, and future policy of Cork-growing in Spain.

283. Fruit and Seed Crops etc.

See also No. 219.

532. NAGARATHNAM, S. **Cashew culture and its potentialities in Andhra Pradesh.** *Indian For.* 84 (5), 1958 (275–80).

Plantations of *Anacardium occidentale* for the production of nuts are being made on a large scale in the reserved forests of the state. The area to be planted is cleared, and the seed dibbled directly in. Failures are made good by basket-plants in the following year. Watering and fertilizing with liquid $(NH_4)_2SO_4$ are necessary in the first year, and desirable in the second. No tending is needed thereafter. Seed-bearing begins in the 5th year, and an average yield is 15 lb./tree/year.

284. Crops Tapped for Exudations etc.

533. STRANGE, J. D. **Report to the Government of India on resin tapping.** Expanded Technical Assistance Programme, FAO, Rome. *FAO Report* No. 890, 1958. pp. 11. Limited distribution.

Describes current methods of tapping Chir (*Pinus longifolia*) and suggests the experimental application of techniques proved successful in the U.S.A., notably bark freshening and chemical stimulation, both to this species and to *P. excelsa* and *P. khasya*.

534. MAGINI, E. Le gemmage—ses avantages et ses inconvénients—aspects techniques et économiques: Italie: recherches sur le gemmage des pins méditerranéens. **[Resin tapping—its advantages and disadvantages—technical and economic aspects: Italy: research on the tapping of Mediterranean Pines.]** [*Docum.*] *6th Sess. FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/67-B*, 1958. pp. 8. [F.] Limited distribution.

Gives a summary account of research in progress at the Forestry Institute at Florence on *Pinus pinea* and *P. pinaster* to determine (1) the effect on resin yield of species, d.b.h., and tapping method, and (2) the effect of tapping on increment, cone and seed production, and seed quality [numbers of trees tapped not stated]. (1) There was no significant difference in yield between the two species except in trees of g.b.h. > 100 cm., where *P. pinea* was superior. For both species and both tapping methods (French and German faces) there was a close linear correlation between yield of resin and g.b.h., but there was much variation between individuals within a diameter class. These experiments showed no clear superiority of German over French faces except in the case of large trees (g.b.h. > 100 cm.) of *P. pinea*. (2) Diameter increment of *P. pinaster* was reduced ca. 8% by 5 years' light continuous tapping with a French face (tapping to death 12%); the reduction was less with a German face. In the case of *P. pinea* 4 years' light continuous tapping with a German face reduced diam. increment by ca. 7%, and tapping to death by 10%. The corresponding reductions in height increment were ca. 6% and 7% for *P. pinaster* (5 years) and *P. pinea* (3–4 years) respectively. Tapping appeared to have little influence on cone production, but both cone and seed weight were higher on tapped trees in the second or third years of tapping, the effect disappearing thereafter. No significant effect was observed on germinative capacity, germinative energy, germination % or 3rd-year seedling survival and height.

535. CRIVELLARI, D. Risultati di alcuni esperimenti sulla resinazione del pino laricio di Calabria. **[Results of some experiments in resin tapping of *Pinus nigra* var. *calabrica* in Calabria.]** *Ital. for. mont.* 13 (3), 1958 (107–24). 4 refs. [It.f.]

Presents full results of experiments begun in 1956, designed to determine yields obtainable by commonly used methods, and the effects of tapping on vigour, increment, and seed production and quality of the tree. Of the methods tested, involving a total of 365 trees, (1) French face, (2) German face, both operated by either (*a*) continuous tapping or (*b*) tapping to death, (2) gave higher yields than (1) for both (*a*) and (*b*). This is the reverse of what was found in the author's similar experiments on *Pinus halepensis* [see *F.A.* 18 No. 2880]. Mean annual yield for trees tapped by (2) (*a*) was 1·5 kg./tree. Small-scale experiments in the use of chemical stimulation indicate that 30% HCl gives best results, but does not increase total yields though it may reduce costs by increasing the intervals between freshenings. The reduction in volume increment caused by tapping was so small as to be negligible; the effect on wood properties has not yet been determined. Results of germination tests during 1949–52 indicate that, so far from having an adverse effect on germinative capacity of seeds, tapping tends to increase it, at least during the first years. Germinative energy, on the other hand, was slightly depressed. The conditions of the experiment made it impossible to compare cone production on tapped and untapped trees, but comparison of mean cone weight and mean weight of seeds per cone indicated that, at any rate in the early years, tapping does not appreciably affect seed production.

536. OSTROM, C. E., TRUE, R. P., and SCHOPMEYER, C. S. **Evidence on the mechanism of oleoresin flow as affected by chemical treatment of wounds.** *Abstr.* in *Plant Physiol.* 32 (Suppl.), 1957 (xxxix–xl). O.R.E.

While the acids used in tapping Slash and Longleaf Pine prolong resin flow by destroying the cambium and parenchymatous tissues in an area extending ca. $\frac{3}{4}$ in. above the wound, they do not appear to stimulate resin formation. When trees were wounded at 12-hourly intervals, i.e. drained faster than resin could be synthesized, there was no significant differences between acid-treated faces and controls.

537. LIANG, J.-H. and LIU, C-W. **[Experiments on the stimulation of resin with saturated $Ca(OH)_2$, 20% HCl, 0·05 and 0·10% 2,4-D, and Fruitone, Rootone, and Transplantone.]** *Bull. Taiwan For. Res. Inst.* No. 42, 1955. pp. 11. 7 refs. [Chin.]

A small, statistically controlled experiment on 120 virgin *Pinus taiwanensis* (mixed with some *P. parviflora* at 800–1000 ft. in the hills) with one German face per tree, and a 3-day freshening cycle lasting 12 months (March 1953–Feb. 1954 inclusive); number of applications of chemical not stated. Significant increases in resin yield resulted from $Ca(OH)_2$, HCl, 0·1% 2,4-D, 0·05% Transplantone, 0·05% Rootone, and 0·01% Fruitone; and in rosin yield from 0·1% Transplantone, 0·05% Rootone, 0·05% Fruitone and 0·01% Fruitone; but in Pine oil, increases were not significant, though $Ca(OH)_2$ and HCl were more effective than the others. Total resin yield per tree with both $Ca(OH)_2$ and HCl averaged 3·4 kg., this being 55% higher than for 0·1% Transplantone. Of the 7 references, 4 are Chinese and 3 Japanese.

538. COOL, B. M. **An investigation of the effect of some production techniques and weather factors on Maple sap and sugar yields in a central Michigan woodlot.** *Abstr. of thesis*, in *Dissert. Abstr.* 19 (1), 1958 (8). O.R.S.

In experiments on 120 trees, carrying 168 buckets, the daily sap weights and sugar % were recorded for 4 years. Tap holes at a height of 1 ft. occasionally got covered with snow and remained frozen, significantly reducing yields, but no significant differences in yield were found between those at 2 and 3 ft., nor between yields from different spout designs. Any gains from increased tapping depths of 4–6 compared with 2 in. would be offset by the additional labour and damage to the trees. Differences in yield caused by varying diameter of tap hole in the range $\frac{3}{8}$–$\frac{15}{16}$ in. were not significant. Annual yield sfrom trees whose sap was caught in plastic bags instead of metal buckets were higher, but not significantly so. In one year, the tap holes on the N. side of trees produced significantly less sap than those on the other three sides, but the difference was not sufficient to justify the risk of concentrating tap-hole damage by omitting the N. side. Yields from trees of a given size having 1, 2 or 3 tap holes were not significantly different. Relationship between sap flow and max. daily temperature was close, but other weather data failed to show any significant correlations.

287. Bamboo and Cane Growing etc.

See also Nos. 176, 875.

539. SETH, S. K. **Natural regeneration and management of Bamboos [in India].** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (404–9). [E.]

Notes on silvicultural characters of the principal species, factors affecting natural regeneration, and cutting cycles for clump-forming species (with special reference to *Dendrocalamus strictus*).

540. AHMAD, Y. S. **Bamboo [in East Pakistan].** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (389–92). [E.f.]

Briefly describes composition, site factors and silviculture of Bamboo forest.

541. AHMED, K. J. **Methods of increasing growth and obtaining natural regeneration of Bamboo type in Asia.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (393–403). [E.f.]

Describes forest types and silviculture, and discusses research problems, mainly with reference to E. Pakistan.

289.4. Shade Trees for Crops

542. CUNNINGHAM, R. K., and LAMB, J. **Cocoa shade and manurial experiment in Ghana.** *Nature, Lond.* 182 (4628), 1958 (119). 1 ref.

An area containing 10-year Cacao planted in straight lines at 8 × 8 ft. spacing under uniform *Gliricidia maculata* shade (24 × 24 ft.) was chosen for shade removal and fertilizer application. The trees were in their third year of bearing, and pre-treatment records were available. Fifteen plots, each containing 300 trees, were marked out. The treatments applied were (*a*) original shade/no fertilizer, (*b*) original shade/fertilizer, (*c*) no shade/no fertilizer, (*d*) no shade/fertilizer. All treatments were replicated 3 times, each replicate having 300 trees, thus making a total of 3600 experimental trees. Treatments (*b*), (*c*), (*d*) all showed significant increases in yield compared with (*a*) in the first year.

3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD : LOGGING AND TRANSPORT. FOREST ENGINEERING

See also Nos. 1, 1285–8.

30. Work Science (Work Studies): General

See also No. 907.

543. HILF, H. H. Forstliche Arbeitswissenschaft. Eine Übersicht über ihre Entwicklung im deutschen Sprachgebiet von 1948–1957. **[Forestry work science. A review of its development in the German-speaking region, 1948–57.]** *Forstarchiv* 29 (5; 7), 1958 (101–10; 149–58). 400 refs. [G.]

A short history of the development of forest work science, including a review of German literature on

the subject, with sections on: methods of research; work physiology; hygiene; forestry education and psychology; work organization and costs, both in general and with reference to the individual operations, e.g. felling, transport, roadbuilding etc.

544. **[W. German forestry work science conference, 1958.]** *Forst- u. Holzw.* 13 (11), 1958 (197–208). [G.]

Includes articles on: Ruhpolding 1958—Conference of the Gesellschaft für forstliche Arbeitswissenschaft, May 4th to 8th; Arranging work in forestry (*H. H. Hilf*) [to improve efficiency and output]; Supplements and allowances with the piece-rate felling tariff (*Leyendecker*); Present-day problems of forest work in Bavaria (*H. Kennel*); Timber felling and transport in high mountains (*G. von Kaufmann*).

301. Methods of Study

545. REHSCHUH, D. Ein Beispiel zur Anwendung der Multimomentaufnahme im Forstbetrieb. **[An example of the use of activity sampling in forestry.]** *Forst- u. Holzw.* 13 (12), 1958 (224–7). 5 refs. [G.g.]

[Cf. *F.A.* 19 No. 1785.] Describes the method and its advantages over other time-study methods, illustrating this with an actual example, taken during skidding investigations, on the loading, transport and unloading of cordwood.

302. Man and Work (Physiology and Psychology)

See also No. 571.

546. Hälsa, arbetsförmåga och effektivitet i skogsarbetet. **[Health, working capacity and effectiveness in forest work.]** *Svenska SkogsvFören. Tidskr.* 56 (2), 1958 (153–200). 30 refs. [Sw.]

Presents, with discussions, the following papers read at the Svenska Skogsvårdsföreningen's annual meeting: Work physiology and rationalization (*U. Sundberg*); Demands of the work and working capacity (*E. H. Christensen*) [includes results of experiments on the relation of O consumption and pulse rate to the duration and type of work]; Medical problems in recruitment and training (*N. Lundgren*); Back troubles—causes and preventive measures (*O. Perey*).

304. Hygiene. Safety; Accidents and their Prevention

See also Nos. 392–3, 546, 575.

547. EDLIN, H. L. **Safety first in the woods.** *Quart. J. For.* 52 (3), 1958 (182–6).

Discusses points to be remembered, on handling tools, on clothing, and on care at the felling point.

548. WEST, A. S. **Biting fly control manual.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 104, 1958. pp. vi + 142. 11 refs.

Provides practical information primarily for the use of those responsible for policy, planning and direction of projects, on how to control flies that bite humans (e.g. mosquitoes, black flies), particularly in the pulpwood cutting areas of Canada, where the trend is towards more summer work.

307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 386–8, 392–3, 429, 459, 484–6, 514, 516, 637–8, 670, 673, 741.

549. KISTENFEGER, J. Der Hanomag-Kettenschlepper K 60 E, 60 PS, in der Forstwirtschaft. **[The Hanomag K 60 E crawler tractor (60 h.p.) in forestry.]** *Forstarchiv* 29 (9), 1958 (214–6). [G.]

A report on technical data, possible uses and performance. It is recommended by the Forsttechnische Prüfausschuss for roadbuilding, as a tractor for heavy attachments in soil cultivation, and for timber extraction.

31. Logging and Transport: General

See also Nos. 218, 581, 1313.

550. HUTCHINSON, I. **Some aspects of logging in British Columbia II.** *Emp. For. Rev.* 37 (2), 1958 (165–87). 8 refs.

[Cf. *F.A.* 19 No. 4240.] Gives an account of scaling, the location and construction of logging roads, methods of logging (yarding, loading, landings, booming and rafting). A glossary of terms used in B.C. logging is added.

551. GUTTENBERG, S., and PERRY, J. D. **Pulpwooding with less manpower.** *Occ. Pap. Sth. For. Exp. Sta.* No. 154, 1957. pp. 34. 11 refs.

Evaluates the labour requirements of several systems of pulpwood logging in various timber types. Three methods of loading and hauling Pine bolts were compared in the flatwoods of Arkansas; a Pine and a mixed Pine/Gum [*Liquidambar styraciflua*?] operation in the hills of Mississippi were observed; and a crew was timed while cutting hardwoods in Mississippi bottomlands.

552. DOW, L. E. **An experiment at co-operative logging in British Guiana.** *Emp. For. Rev.* 37 (2), 1958 (188–99).

An attempt has been made to organize the numerous 'one-man' loggers in British Guiana into co-operative logging societies in order to improve the efficiency of logging methods and the loggers' standard of living and also as a step towards systematic instead of random exploitation. Preliminary results are encouraging, but heavier capitalization and stricter supervision are needed. *From author's summary.*

553. VENET, J. Quelques impressions sur les exploitations forestières en U.R.S.S. **[Some notes on forest exploitation in the U.S.S.R.]** *Rev. for. franç.* 10 (7), 1958 (467–80). [F.]

Describes in some detail the organization of a lespromkhoz, the equipment used (illustrated), transport etc.

554. MÉGILLE, X. DE. La recherche scientifique en U.R.S.S. dans le domaine de l'exploitation forestière. **[Scientific research in logging in the U.S.S.R.]** *Rev. Bois Appl.* 13 (6), 1958 (17–23). [F.]

An account of the organization and scope of CNIIMÉ [Central Research Institute for Mechanization and Power in the Forest Industry] in Moscow,

is followed by an illustrated description of some of the machinery used, including: a heavy crawler tractor on to which complete trees are felled directly [cf. *F.A.* 19 No. 1796]; a wheeled tractor in which the air-pressure of the tyres can be varied during work; power-driven trailers for log transport; a crawler tractor with a crossbeam above the cab, so that bundles of logs can be attached at both sides of the tractor and skidded simultaneously; and a special trimming device (illustrated) [cf. *F.A.* 19 No. 1808].

32. Felling and Related Operations

322. Felling Season. Preparatory Measures

555. MAKKONEN, O. Aikatutkimuksia kuusipaperipuiden valmistuksesta rasiinkaatoa käyttäen. **[Time studies on 'sour felling' and preparation of Spruce pulpwood.]** *Pap. ja Puu* 40 (7), 1958 (361–5). [Fi.e.*e.*] P.R.

[Cf. *F.A.* 19 No. 4242.] In the 'sour-felling' experiments the trees were allowed to lie as felled for 2 weeks, 1 month, and 2 months before barking, and barked 2-m. Spruce pulpwood was also prepared in the normal way. 'Sour felling' did not appear to affect barking time; this appeared to be affected by variations in bark thickness and toughness, attributable to the growing site rather than to the seasoning period. Working time for other operations [e.g. trimming, cross-cutting] also appeared to be unaffected by 'sour felling'. It should therefore be possible to introduce 'sour felling' without changes in the wage structure for preparing Spruce pulpwood. *From author's summary.*

556. BOLDT, C. E. **Kiln cordwood can be seasoned rapidly prior to bucking.** *Tech. Note Lake St. For. Exp. Sta.* No. 530, 1958. pp. 2.

Tests on 5 pairs of Sugar Maple in N. Michigan felled in August showed that the 5 trees left for 25 days until the leaves had withered, and then cross-cut, had a m.c. 13% lower than that of the trees cross-cut immediately after felling. The former were dry enough to carbonize (for charcoal) efficiently; the latter still needed several months' air-seasoning.

557. PETERSON, K. R., WALTERS, C. S., and MEEK, W. L. **Barking Black Oak [*Quercus velutina*] and Jack Pine [*Pinus banksiana*] fence posts with sodium arsenite.** *Bull. Ill. agric. Exp. Sta.* No. 626, 1958. pp. 30. 11 refs.

Tests were made on 360 post-size trees (half Black Oak and half Jack Pine), the Na arsenite being applied to girdles in different concentrations, as a solution or as a paste, and in different months. Results were difficult to evaluate, many factors in addition to season and type of poisoning being involved, e.g. weather, skill of operators, size and quality of post, bark thickness and girdling technique. In general, however, it would be useful to poison trees in the spring and bark them in the following winter. Girdling should be done just above the root collar, and poison (20 g./100 ml. water) applied by brush.

558. CHERNG-JIANN, S., BROWN, R. M., and REES, L. W. **Aspen debarking with 2,4,5-T.** *J. For.* 56 (7), 1958 (503–7). 10 refs.

The resistance to barking of Aspen cut in the dormant season was significantly reduced by spraying the trees with butoxyl ethanol ester of 2,4,5-T. Breast-height spraying was more effective than basal spraying, and June treatments gave the best results. No difference was observed between treatments using concentrations of 16, 21 and 25 lb. acid equivalent/100 gal. diesel oil. Tyloses, which may retard chemical pulping, were abundant in the sapwood of treated Aspen, and the spray is not considered likely to prevent suckering. Applications of 2,4-D did not reduce resistance to barking.

323. Felling and Subsequent Primary Conversion

See also Nos. 555, 565–80.

559. BOČKO, N. A., and ROMANENKO, E. I. Očistka stvolov ot suč'ev trosovoj petlej. **[Trimming stems with a cable loop.]** *Lesn. Prom.* 1958 (8), (9–10). [Russ.]

Three linked wire cables, 17·5–22 mm. in diam., are attached to two low stumps in such a way that bundles of untrimmed Spruce and Fir trees can be skidded to them and the cables wound round the tops of the skidded trees. The skidding tractor then drives forward as fast as possible, pulling the trees through the loops of the cables, which rip off the branches. The best results were obtained with bundles of 2–2·5 cu.m. with the TDT-40 tractor and 2·5–3 cu.m. with the TDT-60. Ca. 80–90% of the branches are removed in this way, and at the industrial log depot, one man with an electric branch-trimmer can complete the trimming, up to 100 cu.m. of tree-length logs being trimmed per [8-hr.] shift. The use of this method with winch skidding is also described.

33. Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood. Salvage Fellings

See also No. 517.

560. ČOKL, M. Količina in struktura lesnih odpadkov v gozdni proizvodnje. (Prethodno poročilo). **[A preliminary report on the amount and composition of slash in forest production.]** *Zborn. Inst. gozd. lesn. Gospod. Sloven.* No. 2, 1957 (55–77). 3 refs. [Sloven.g.*g.*]

The amounts of slash on 62 plots yielding a total of 1189 cu.m. of timber in Beech, Silver Fir and Spruce forests in Slovenia are shown per 100 cu.m. of timber in terms of stumpwood, top, cull, stem wood, bark, and branchwood of < 7 cm. diam. The highest % of waste is given by the bark. The refuse in felling Beech is much less than in felling Spruce and Fir, because Beech slash is much used as firewood, and also because Beech has a thinner bark. The grouping of stands by site class is recommended for future studies, as this has a definite influence on the % of refuse.

561. FEDOROVICI, C. Pierderi de material lemnos prin cioatele înalte. **[Loss of wood through high**

stumps.] *Rev. Pădurilor* 1958 (4), (224–7). [Rum.]

Gives graphs and tables showing % loss of volume for trees of 10–100 cm. diam. cut so as to leave stumps of 10, 20, 30 . . . 100 cm., for Norway Spruce, Silver Fir, Beech and Oak.

562. Badea, M. Contribuţii la cunoaşterea problemei curăţirii parchetelor. [**Problems of slash disposal.**] *Rev. Pădurilor* 1957 (12), (781–4). 8 refs. [Rum.]

Makes recommendations for regulation of slash disposal, e.g. collection into heaps on areas of progressive or successive regeneration fellings, into windrows along the contours on clear-felled areas on slopes < 20%, and scattering all over the felling area on sandy soils and steep slopes.

34. Storage of Wood in the Forest and at Log Dumps ('Landings')

See also Nos. 1152–5, 1162–4, 1174, 1179.

563. Anketa o umístění manipulace dříví v lese nebo na skladech s příhlédnutím k požadavkům celého lesního hospodářství. [**Enquiry into the place of timber-handling in the forest or in timber-yards, having regard to the demands of forestry as a whole.**] *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 3 (3), 1957 (177–278). [Cz.russ.g.]

The number is devoted to the proceedings of an enquiry held in March 1956. Individual papers are reported in Czech and resolutions of various sub-committees in Czech, Russian and German.

564. Czereyski, K. Klasyfikacja składnic drewna. [**Classification of storage sites.**] *Roczn. Nauk leśn.* No. 18, 1957 (187–204). 13 refs. [Pol.russ.e.]

Ten types of site distinguished as important in Poland are listed. Factors used in the classification are: position in relation to felling site and destination; purpose (e.g. transferring from one type of transport to another, bundling rafts, storage); period of use (seasonal or permanent); capacity; equipment.

35. Performance Measurements for Determining Piece Rates in Felling and Related Operations

See also No. 555.

565. Eckert, K.-H. Die Verteilung von Arbeitszeitwerten im Hauungsbetrieb. [**The [frequency] distribution of time taken in primary conversion.**] *Forstwiss. Cbl.* 77 (5/6), 1958 (178–88). 20 refs. [G.g.]

Gives the results of time studies on the primary conversion of unbarked Beech and barked Spruce and Scots Pine. The frequency distributions of the times were rather asymmetrical (skew mainly to the left).

566. Makkonen, O. Jatkotutkimuksia jalkamittaisten havapuurankojen hankinnasta Pohjois-Suomessa. [**Further studies on the felling and extraction of softwood long logs measured in feet in N. Finland.**] *Tied., Metsäteho, Helsinki* No. 145, 1958. pp. 6. [Fi.e.*e.*]

[Cf. *F.A.* 18 No. 4128.] Results of time studies on felling and hauling are given in a graph and tables. One set of trials comprised the preparation of 9-ft. sleeper logs, 11-ft. pitprops and 2-m. unbarked pulpwood logs (the latter being made from stems too small for 11-ft. props), and the other, which proved to give better utilization of the stem, of sleeper logs and pulpwood logs only. The mean volume of the utilized part of the stem was 0·25 cu.m. o.b. for Spruce and 0·15 for Pine. Working time to prepare 2-m. pulpwood logs and 11-ft. props was in the ratio 100/85, and the working-time ratio Pine to Spruce in preparation of pulpwood 100/158–159, the Spruce being smaller and branchier than the Pine. Total felling and hauling time was now, contrary to the result of the previous study, slightly less per solid cu.m. for long logs than for 2-m. pulpwood: the change is attributed to the use of side supports on the sledges. *From author's summary.*

36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 392–3, 484, 514, 559.

567. Salminen, J. Tutkimuksia Cambio 35 kuorimakoneiden käytöstä. [**Investigations into the use of Cambio 35 barking machines.**] *Tied., Metsäteho, Helsinki* No. 146, 1958. pp. 46. [Fi.e.*e.*]

Describes the machine [cf. *F.A.* 17 No. 2860] and some results of work studies and practical experience in Finland. The normal gang is 3–4 men. Average output in summer barking of softwoods was 102–139 unbarked stacked cu.m. in 8 hours, depending on whether the team stacked the wood or not. Output increased with log length and with experience of the machine. It was lower for Birch and for winter barking. Quality was rather better and barking loss rather less than with hand barking, with which costs are compared and discussed.

568. Überstellbare Entrindungsmaschine CHEJ. [**The CHEJ portable barking machine.**] *Allg. Forstztg.* 69 (11/12), 1958 (160). [G.]

The machine, powered by a 20-h.p. motor, has six rotating hard-metal knives which are pressed tangentially (by adjustable springs) on to the log or pulpwood piece, fed singly into it automatically or by hand. Feed speeds are adjustable from 52 to 131 ft./min. Output (at 105 ft./min.) varied from 25 to 60 cu.m./hour according to diameter. The machine is mounted on two rubber-tyred wheels.

569. Siren, G. Kannattaako käyttää raivaussahaa? [**Is the use of the clearing saw profitable?**] *Metsät. Aikak.* 1958 (5), (144 . . . 149). 3 refs. [Fi.e.]

Concludes, from a study of the saw and of the brush hook, that the saw can be profitable if enough work is available in summer and with a skilled operator having a knowledge of maintenance. [Cf. *F.A.* 19 No. 1731.] *From author's summary.*

570. **Bow saws.** *Rep. For. Prod. Res. Bd., Lond. 1957*, 1958 (19).

Appreciable variations in the service life of saws with 1 raker and 2 cross-cut teeth with hardened tips were investigated. Microscopic examination revealed that the tips of the cross-cut teeth were often fractured and broken off, the extent and severity of damage being relatable to the performance of the

saw. Minor damage to the point of cross-cut teeth had an appreciable effect on initial performance and caused accelerated blunting, at least during the early stages of service life.

571. EISENHAUER, G. Die Arbeit mit der Einmannsäge. **[Work with one-man saws.]** *Abstr. of thesis*, in *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 3, 1958 (71–3). [G.]

Work-physiological investigations on posture, technique and speed, with special reference to work with bow saws. For cross-cutting up to 22 cm. diam., these proved superior to one-man cross-cut saws (*Fuchsschwanzsägen*), even when the latter had been equipped with the best of several tooth patterns tried. For felling, their use on diameters > 20 cm. is not recommended.

572. KAMINSKY, G. Neue Einmann-Motorsägen. **[New one-man power saws.]** *Forstarchiv* 29 (5), 1958 (125–7). [G.]

Gives technical data and costs of 4 power saws from Germany, Norway, U.S.A. and U.S.S.R. that have appeared in the last two years. The merits of each are briefly discussed.

573. **New Australian chain saw.** *Aust. Timb. J.* 24 (5), 1958 (77).

Champion Saws Pty. Ltd. of Sydney has announced a new one-man chain saw, the 'Universal', developed for Australian conditions. Capacity is 8·45 cu. in. (30% more than any American saw) enabling it to work all day on the toughest hardwoods at an engine speed only half of the smaller overseas engines, and yet maintain the same speed of cutting. It has fully automatic centrifugal clutch, automatic oiling (Australian patent), all-position carburettor, double-life chain-drive sprocket, 2-position cutter bar, keyboard controls, chain safety guard, and kick-proof starter.

574. LAUTNER, È. M. Issledovanie raboty zubčatogo venca sučkorezok. **[Investigation of the work of toothed-edge branch trimmers.]** *Lesn. Prom.* 1957 (9), (22–4). [Russ.]

The efficiency of 4 different arrangements of cutting teeth and ⌐-shaped raker teeth on chain saws was compared with that of a standard conventional Russian chain saw, PC-15M. The tooth arrangement right cutter, left cutter, right raker, left raker, was found to be the best. For sawing at acute angles to the grain, a sharpness angle of 40–50° is recommended for the rakers, and with this, the raker teeth do not need to be lower than the cutters. The optimum chip thickness is 0·4–0·6 mm.

575. POND, T. M. **Power saw accidents—causes and remedies.** *Pulp Paper Mag. Can.* 59 (7), 1958 (148–51, 153 . . . 164).

A panel discussion with papers on: statistics (*E. N. Denison*); injuries (*F. W. Stevens*); and training (*R. Ferragne*). A training programme, laid down with manufacturers' co-operation and continually maintained, is the important means for reducing accidents.

576. LEBACQ, L. Mécanisation de certaines opérations lors de l'ouverture d'une plantation dans la Cuvette centrale. **[The mechanization of certain operations when clear-felling for planting in the Central [Congo] Basin.]** *Bull. agric. Congo belge* 49 (3), 1958 (657–81). 2 refs. [F.du.]

Compares the cost of clearing secondary forest (*a*) exclusively by hand labour and (*b*) with power saws and hand labour [as described in *F.A.* 18 No. 4123]. Man-days/ha. required for (*a*) and (*b*) respectively are: cutting out undergrowth and lianes 20, 20; felling 60, 23; cross-cutting and laying 20, 10; and opening lines 80, 19. The saving on (*b*) is 60% in man-days/ha. and Fr.1451/ha. in money, the latter including initial amortization of the saws (cost, spares and repairs for 3600 hours). Hand labour is estimated as Fr.27/man-day, which excludes overheads (management, medical etc.) the addition of which might double this figure.

577. SUTTER. Holzwerbung mit Ein-Mann-Motorsägen bei baum- oder sortenweisem Rücken. **[Logging with one-man power saws, combined with tree-length or assortment skidding.]** *Allg. Forstzeitschr.* 13 (25), 1958 (354–8). [G.]

Discusses findings of a thesis on methods of integrating felling and primary conversion with power saws, and skidding (mostly still unmechanized). In general, concentration of primary conversion at landings and the use of 2- or 4-man teams, working at different tasks and taking turns with the saw, proved most efficient.

578. FIOŁEK, S. Zespołowe pozyskiwanie drewna przy użyciu piły silnikowej. **[The use of the power saw in complex felling operations.]** *Roczn. Nauk leśn.* No. 18, 1957 (3–114). 8 refs. [Pol.russ.e.]

Results of investigations on harvesting unbarked timber, barked pitprops, pulpwood, poles and fuelwood in Pine stands subjected to clear felling, selection felling, and thinning, are given in tables and graphs, showing the different operations involved. The system of felling did not affect the quantitative results, but qualitative results were best for clear felling and worst for progressive strip felling. Better qualitative and quantitative results were obtained when the undercut was made with the axe than with the saw. Careful organization of the work, maintenance of the power saw, and inclusion of fully trained workers in the team, increased output well above the mean results of the investigations. Disadvantages of the 'Pilana'-type saw used include its weight, the gases produced, vibration and noise, and the relatively complicated handling needed; the use where possible of electric saws is recommended. Techniques of recording in these investigations are discussed. *From author's summary.*

579. **Chips made in woods.** *Sth. Lumberm.* 196 (2451), 1958 (46).

Describes an installation of the St. Regis Paper Co., at Fargo, Ga., in the Suwannee forest, at which all logs after barking are moved to a cut-off saw where sawtimber, pilings etc. are separated and the rest then automatically chipped and loaded into railway trucks for transport to the mill, 75 miles away.

580. KONDRAT'EV, V. I. Malogabaritnyj snegoočistitel'. [**A small snow-clearer.**] *Lesn. Prom.* 1958 (7), (13). [Russ.]

Describes a prototype portable snow-clearer made on the basis of the Družba power saw. The small petrol engine drives a 6-bladed rotor at 500–1100 rev./min., snow being impelled at a rate (theoretical) of 150 cu.m./hr. and for a distance of 4–8 m. Trials were made when snow lay in the felling area to a depth of 80 cm. The machine was used to clear a track from tree to tree, and around each tree to permit felling. At an average distance of 13 m. between trees, the rate of work was 25 trees/hr. It took 1·2 min. to clear a space around each tree, compared with 4·7 min. using a hand shovel. The machine weighs 14·5 kg. when fuelled, and uses 10·6 g. petrol/cu.m. snow cleared.

37. Transport

372/377. Land Transport

See also Nos. 549, 554, 566.

581. LOYCKE, H. J. Der Einfluss der letzten technischen Entwicklung auf die Gestaltung der Forstarbeit im In- und Ausland. [**The influence of recent technical developments on forest work in Germany and abroad.**] *Forst- u. Holzw.* 13 (13), 1958 (237–42). 24 refs. [G.]

Examines the state of, and scope for further, mechanization of forest work in (1) the U.S.S.R. and N. America, (2) Central Europe (particularly W. Germany), (3) Scandinavia, and (4) the Mediterranean countries. Particular attention is paid to the mechanization of extraction, and examples of extraction methods are outlined. The author considers that the machinery now at the forester's disposal requires the development of special, carefully thought-out, and more economical, methods of work.

582. HORNCASTLE, D. C. **Progress report on full tree logging.** *Pulp Paper Mag. Can.* 59 (5), 1958 (163–4, 166).

Reports improvements in methods since 1953 with data on costs, production and crews.

583. GORŠKOV, D. Pogruzka hlystov trelevočnym traktorom. [**Loading tree-length logs with a skidding tractor.**] *Lesn. Prom.* 1958 (5), (12–3). [Russ.]

Tree-length logs are skidded to a simple ramp made of beams, which is set up at the side of a lorry road or narrow-gauge railway. On the other side of the road is placed a movable trestle-type framework. One end of a cable running over a block on this framework is attached to the bundle of logs, the other to a tractor which pulls the logs to the top of the ramp, whence they fall on to the lorry or wagon waiting in position. It is claimed that a TDT-40 tractor can load 1 cu.m. of tree-length Pine logs in 1·9 min. by this method.

584. RAEV, O. E. Mehanizacija pogruzki lesa—na pravil'nyj put'. [**Mechanized timber loading—the correct way.**] *Lesn. Prom.* 1958 (5), (10–2). [Russ.]

Discusses the advantages of Drott motorized equipment used in Canada for loading logs direct from stacks on to lorries, but considers that, under conditions in the U.S.S.R., winch loading by the method described by Gorškov [see preceding abstract] is simpler and more universally applicable.

585. LASICA, M. D.; SUMAČEV, M. S.; JAKOVLEV, V. Krupnopaketnaja pogruzka hlystov. [**Loading large parcels of tree-length logs.**] *Lesn. Prom.* 1958 (8), (6–8). [Russ.]

An article comprising 3 notes on loading methods, in which the basic principle is to raise the parcel of logs by winch or tractor and cables, either up a ramp, or by means of pairs of standing or inclined derricks [cf. preceding abstracts], and then load it directly on to a lorry.

586. BELYJ, L. M. Pogruzočnyj kran na traktore. [**A tractor-mounted loading crane.**] *Lesn. Prom.* 1958 (6), (26). [Russ.]

The simple crane is rear-mounted on the frame of a KT-12 tractor. The design, which is described, calls for a load cable of 15·5 or 18 mm. diam., and a wooden boom supported by a cable of 18 mm. diam.

587. FROLOV, A. V., and URIN, JA. M. Pogruzčik na avtomobil ZIL-151. [**A loading crane on the ZIL-151 lorry.**] *Lesn. Prom.* 1958 (7), (10–1). [Russ.]

A more detailed description [cf. *F.A.* 19 No. 4258].

588. STAJNIAK, J. Próba ustalenia przydatności wciągarki TL-3/II do prac na składnicach drewna. [**A trial of the value of the TL-3/II winch in operations at storage sites.**] *Roczn. Nauk leśn.* No. 18, 1957 (205–26). 7 refs. [Pol.russ.e.]

Gives the specifications of the winch and describes (with illustrations) various loading and unloading lay-outs, using e.g. derricks, which have been successfully operated with it in preliminary trials by the Polish Forestry Research Institute. Performance details are given.

589. LEPITRE, C. Cables de débardage. [**Wire ropes for logging.**] *Bois For. Trop.* No. 60, 1958 (25–40). [F.e.span.]

Reviews the main operating conditions for ropes used in tropical logging by crawler tractors of 100 h.p. Notes are given on service life of the types principally used in the field, all of 1-in. (25 mm.) diam. A total output of 1200 cu.m. may be regarded as reasonable for 45 m. of 1-in. wire rope. Comparative service tests have been carried out in the Ivory Coast on American and French wire ropes supplied by 3 manufacturers. The net result was in favour of the French ropes; their useful life is slightly less than that of the American ropes but they are appreciably cheaper. The following recommendations are made on the types of wire rope most suitable for skidding: (1) independent wire-rope core, (2) high-resistance steel, (3) preformed wire, (4) regular lay of the strands, (5) diam. 1–1⅛ in. for D.7. tractor. The 6 × 25 Seale Filler Wire seems capable of universal use, giving satisfactory service in most cases. The importance of the way in which wire ropes are used (e.g. neat winding) by tractor operators, is stressed. *From author's summary.*

590. **Provisional protocol for the testing of winches.** [*Publ.*] *FAO/ECE Jt. Comm. Working Tech.* No. *FAO/ECE/LOG*/25, 1958. pp. 6.

591. BURK, A. H. **Cable yarding on Eastern Canadian pulpwood operations. An analysis of the 1957 yarding committee questionnaire on cable yarding.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1769 (*B*-8-*g*), 1958. pp. 5. 17 refs.

Covers similar ground to that of a previous paper [see *F.A.* 16 No. 4142].

592. S., M. Lunning med vinsch: resultat och erfarenheter av fortsatta vinschlunning försök i Värmland. **[Winch skidding: results from further investigations in Värmland.]** *Skogen* 45 (13), 1958 (380–1). [Sw.]

Further trials in the 1957–58 season showed that additional modifications in the 'Domänvinsch' [see *F.A.* 18 No. 4129] were desirable. The new model [illustrated] has a 13½-h.p. Ilo motor that drives the winch through a self-adjusting clutch. The cable passes from the drum through a rotating guide, the drum is narrower, and wear on the cable less. Total weight is 190 kg. The winch is controlled by radio; the operator carries a small battery-powered transmitter (1 kg.) by which he can start and stop the winch and control its speed. This means that one man prepares and accompanies the load and controls the winch; this reduces the risk of accidents, and extends the range of winching beyond the distance where the winch operator and the loader are within sight of each other. Operating costs of the radio-controlled winch have not yet been determined but one month's experience in its use suggests that they will be less than with a normal winch. The price will probably be about Kr.5500.

593. DRESSLER, and ADÁMEK. K výpočtům vyklizovacích lanovek. **[Calculations for small skidding cableways.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (1), 1958 (67–86). 7 refs. [Cz.]

A report of investigations made on the VL-u and VL-n [Czech?] installations, on the braking power, and forces involved when conveying by gravity and otherwise, etc.

594. MEYR, R. Zeit- und Materialaufwand für die Errichtung und den Betrieb eines Mittelstreckenseilkranes. **[Time and materials required for the erection and operation of a medium-length skyline cable.]** *Allg. Forstztg.* 69 (11/12), 1958: *Suppl.* (*Informationsdienst No. 9*) pp. 2. [G.]

Gives data for an installation 500 m. long, requiring 2 single-tree intermediate supports. With 40 loads (each of 0·7 cu.m.) per day, and a total of 500 cu.m. to be moved (mostly Beech), costs per cu.m. were ca. 46 Sch., half for operation, 20% for erecting and dismantling, and 30% for amortization.

595. MILLER, M. S., and DEGERMENDŽI, P. A. Podvesnaja trelevočnaja ustanovka SibNIILHÈ. **[The SibNIILHÈ skyline installation.]** *Lesn. Prom.* 1957 (8), (5–8 + 3 plates, 1 drawing). [Russ.]

Describes in detail the installation (developed by the Siberian Forestry and Forest Utilization Research Institute) which, powered by the L-20 winch, can convey tree-length logs and whole trees, for a distance up to 650 m.; output up to 115 cu.m./shift.

596. PERFILOV, M., and RODIONOV, V. VTU-3 s lebedkoj L-70 na trelevke lesa v gornyh uslovijah. **[The VTU-3 [overhead skidding installation] with the L-70 winch for skidding timber in the mountains.]** *Lesn. Prom.* 1957 (9), (14–7). [Russ.]

Describes the lay-out of the VTU-3, which can take loads up to 3 tons, the design and performance of the 1-drum L-70 winch developed for the installation, and the organization of work.

597. ROMANENCO, S., and ZUCA, M. Funicularul TU-1500. **[The TU-1500 cableway.]** *Rev. Pădurilor* 1957 (12), (790–3). [Rum.]

Describes the Czechoslovakian TU-1500 aerial cableway, its installation and the results of trials in Rumania. Optimum working distance is 500 m. but it can work over as much as 1000 m. It is driven by a 12–15-h.p. motor. Time for transporting loads of 1000 kg. for a distance of 100 m. are: empty journey 1 min., loading 1 min., full journey 4 min., unloading 1 min.

598. CZEREYSKI, K., and HAINTZE, S. Koszowy czepiec zrywkowy. **[A resilient skidding cap.]** *Roczn. Nauk leśn.* No. 18, 1957 (227–37). 7 refs. [Pol.russ.e.]

Describes, with illustrations, a 'cap' designed at a station of the Polish Forest Research Institute, which consists of 6 arms of spring steel, each carrying towards the base a tooth for gripping the end of the log. These arms are linked basally in a circle, by a chain, and another short length of chain runs from the tip of each to a small metal, spring-loaded disc, so that the whole construction forms a cone when the chains are taut. Tests show that the device facilitates skidding over obstacles, and its low weight (17 kg.) is an advantage. Measurements of friction showed a decrease in resistance on soft ground when the cap was attached to the butt end of the log, but it had no effect on resistance, either on soft or hard ground, when attached to the top end.

599. KRAVCOV, S. N. Sani dlja vyvozki lesa v hlystah po avtoledjanoj doroge. **[Sledges for transport of tree-length logs on ice lorry roads.]** *Lesn. Prom.* 1957 (9), (10–1). [Russ.]

Small lorries were used with one Pallo sledge trailed close behind, and an AOS-6 sledge further behind. The average load per trip was 10–14 cu.m., but improvements in sledge design (described and illustrated) enabled loads of 24–34 cu.m. to be carried, and more powerful lorries to be used economically.

600. KISTENFEGER, J. Die Rückgeräte Rückrolli und Widder. **[The Rückrolli and Widder logging wheels.]** *Forstarchiv* 29 (1), 1958 (23–4). [G.]

Gives technical details and the results of tests of these two makes (one Swiss, one German), whose relative merits are discussed as regards loading capacity and speed, ease of manoeuvre in the forest, possibility of accidents, and price.

601. GORŠKOV, D., and FALLER, A. Moščnye trelevočnye traktory. [**Powerful skidding tractors.**] *Lesn. Prom.* 1957 (12), (8–11). [Russ.]

Some experimental 140-h.p. crawler tractors, equipped with winches, were each fitted with a massive, double-console, tubular-metal skidding arch, mounted transversely above the body of the tractor and incorporating a crossbar projecting well beyond the tracks of the tractor. At each end of this crossbar is slung a pulley, so that 2 bundles of tree-length logs or full trees can be skidded simultaneously at each side of the tractor. Practical trials in summer and winter, and the organization of skidding are described in detail. It is calculated that it will be practicable to use these tractors for direct transport of timber for distances of up to 6 km. Loads of 26–30 cu.m. per trip are possible in summer, and the tractor can work on slopes of up to 20°.

602. VASIL'EV, Z. B. Prjamaja vyvozka lesa traktorami S-80 pri očistke loža Bratskogo vodohraniliščа. [**Direct extraction of timber by S-80 tractors, in clearing a bed for the Bratsk reservoir.**] *Lesn. Prom.* 1957 (8), (8–10). [Russ.]

Investigations on the performance and cost of diesel-engined S-80 tractors extracting timber direct [method not further specified] from the reservoir site to launching depôts, showed that it was more economical to work in this way for distances up to 4·5 km. in winter and 3·1 km. in summer, rather than to skid the timber to lorries for transport by road. In direct extraction, loads averaged 9 cu.m. timber per trip in summer, and 12·5 cu.m. in winter; speeds with load averaged 2·25, and return speeds 4·5 km./hour.

603. KAPITONOV, I. T. Trelevka lesa na Urale traktorami S-80. [**Skidding timber in the Urals with S-80 tractors.**] *Lesn. Prom.* 1957 (9), (5–8). [Russ.]

Describes the organization of tractor skidding of whole trees, in summer and winter, up to distances of 800 m. The working time is analysed, and details of tractor performance are given.

604. HAKKARAINEN, A. E. Kaksi ja kolmiakselisen puutavara-auton käyttökustannuksien vertailu. [**Comparison of the operating costs of 2-axle and 3-axle timber lorries.**] *Tied., Metsäteho, Helsinki* No. 144, 1958. pp. 6. [Fi.e.*e.*]

Results of cost analyses are tabulated. A 3-axle lorry without trailer or with a 2-axle semi-trailer proved more economical in timber haulage work than the corresponding 2-axle type, and the difference increased with increasing distance covered. *From author's summary.*

605. IVANOV, V. A. Bezdyšlovaja scepka avtomobilija s rospuskom. [**A lorry with no reach, for log transport.**] *Lesn. Prom.* 1958 (5), (7–10). [Russ.]

Describes the 2P-15 log carriage, which has 4 double wheels in a very small wheelbase, and is designed for use with the MAZ-200 lorry (without a reach or rigid connecting member) for road transport of tree-length logs. On no-load runs the log carriage is raised on to the platform of the lorry. In tests, the unit performed well, even on rough roads with sharp bends.

606. LEKSAU, I. N. Smennye pricepy k avtomobilju MAZ-501. [**Detachable trailers for the MAZ-501 lorry.**] *Lesn. Prom.* 1958 (7), (7–9). [Russ.]

Describes two combinations of trailers used with the lorry: a 2-wheeled, semi-trailer 1-PP-12.5, with (*a*) a 2-wheeled trailer 1-R-8, or (*b*) a 4-wheeled trailer 2-R-15. With (*a*) the unit can carry 20 tons of tree-length logs, with (*b*) 27 tons. Details are given of the design of the 1-PP-12.5 and the 1-R-8, and of the organization of transport work with them.

607. **Collapsible fuel storage tank.** *For. Equipm. Note, FAO* No. *B.*13.57, 1957. pp. 2.

Describes pillow-shaped tanks for temporary storage of bulk liquids, made from two layers of fabric-reinforced synthetic rubber, available in 900, 3000, 10,000 and (on special order) 50,000 gal. sizes, manufactured by the Goodyear International Corporation, Akron, Ohio.

608. NESTERENKO, V. G. Stroitel'stvo motovoznoj dorogi v zaboločennoj mestnosti. [**Building narrow-gauge railways in marshy areas.**] *Lesn. Prom.* 1957 (8), (15–6). [Russ.]

Describes three types of two-layer corduroy roadbed used successfully as a foundation for a narrow-gauge (75-cm.) line for timber extraction.

609. ABRAMOV, S. A. Uzkolinejnyj teplovoz s ėlektroperedačej. [**A narrow-gauge diesel locomotive with electric transmission.**] *Lesn. Prom.* 1957 (12), (12–4). [Russ.]

Describes the prototype locomotive in which a diesel engine drives 2 electric generators that feed 4 electric-drive motors. In trials, the locomotive was used for timber transport and general freight and passenger work on narrow-gauge forest railways. It is now recommended for mass production.

378. Water Transport

See also No. 1050.

610. VOROB'EV, A. G., and SMIRNOV, N. I. Pribory VS-1 i VS-3 dlja rasčeta pučkov. [**The VS-1 and VS-3 instruments for calculating bundle dimensions.**] *Lesn. Prom.* 1957 (9), (20–2). [Russ.]

Explains, with an example, A.G. Vorob'ev's 'elastic theory of bundles', on which is based the VS-1 instrument for calculating the length of bundle-fastenings and the strain on them for bundles of any given cross-sectional area, and for determining the shape and dimensions of bundles on dry land. This instrument is described in detail; the VS-3, which is mentioned only briefly, enables similar data, including draught, to be obtained for bundles in the water.

611. SUTJAGIN, N. A. Zimnaja splotka drevesiny v sannyh stankah-formah. [**Binding logs into bundles in winter in sledge-type bundle-forming units.**] *Lesn. Prom.* 1957 (12), (20–1). [Russ.]

Sledges with upright stays at the front and rear are lined up alongside and at right angles to a sorting conveyor which automatically ejects the

logs it is carrying, in assortments, on to the sledges. The latter are designed so that the logs falling across them will form bundles of the right shape for floating. When a sledge is full, the logs on it are bound into a bundle, the sledge is hauled out by a winch, and the bundle offloaded. Organization on these lines obviates the need for stacking logs, requires little labour, and provides bundles of uniform and optimum shape.

612. NEVSKIJ, E. G. Mehanizacija zimnej splotki. **[Mechanization of bundle assembly in the winter.]** *Lesn. Prom.* 1957 (11), (16–20). 2 refs. [Russ.]

In smaller depôts where log-sorting conveyors [cf. *F.A.* 16 No. 4152] are uneconomic, a fork-loader or a vertical fork-lift mounted on an S-80 tractor can be used for making and assembling bundles. Details are given of these two machines, and of 3 methods of organizing work with them.

613. BEZRUKOV, F. V., and MAKSIMOV, V. S. Racional'nyj sposob splava listvennyh porod. **[A sensible way of floating broadleaved species.]** *Lesn. Prom.* 1958 (7), (17–8). [Russ.]

By setting up floating depôts for short periods as far upstream as rafting is possible, the loose floating of logs is cut considerably. Sinkage losses of logs of broadleaved species or Larch are claimed to be reduced or eliminated by this procedure, as practised on the Lovat and Pola rivers, in the basin S. of Lake Ilmen, U.S.S.R.

614. KONDRAT'EV, V. M. Šire vnedrjat' poperečnye zapani pri splave lesa v pučkah. **[Use more transverse trap-booms when floating timber in bundles.]** *Lesn. Prom.* 1958 (6), (27–9). [Russ.]

Discusses the use of the booms, e.g. in sorting and raft-making depôts, and in sorting and unloading depôts, and gives examples of the lay-out of installations and the sequence of river work when these booms are used. The behaviour of bundles in jams caused by the booms is examined for various speeds of current, depths of water and bundle draughts, volumes and bulk densities.

615. PESOLA, A. Suurten jonokuormien kuljetus Päijänteellä. **[Rafting loads consisting of long bundles on Lake Päijänne.]** *Metsät. Aikak.* 1958 (5), (133–8). [Fi.e.]

The basis of the load (illustrated in photographs and diagrams) is a unit 8·5 m. long, consisting of 2 bundles joined lengthwise by long timbers. The completed raft consists of 716 bundles, comprising 15,000 cu.m. solid or 21,000 cu.m. stacked measure, and measures 430 × 60 m. Results over 2 years have been good. *From author's summary.*

616. KARAVAEV, A. M. Novye ploty dlja Angary. **[New rafts for the Angara river.]** *Lesn. Prom.* 1958 (5), (16–8). [Russ.]

Describes in detail the construction of rafts containing ca. 4000 cu.m. of logs, made in 3 sections, each measuring 115 × 22 m., and with no braking gear. Less expensive equipment and less time are required to make them, towing is easier and quicker, and fewer personnel are needed, than for rafts of conventional design.

617. BELJAEV, S. A. Pučkovoj plot bol'šoj osadki. **[A deep-draught bundle raft.]** *Lesn. Prom.* 1958 (8), (20–1). [Russ.]

Describes the construction of the raft, which was composed of bundles of 2–2·8 m. draught, and had no surrounding boom.

618. KURAGIN, V., ŠČAPIN, V., and JUZVUK, V. Skrepery na pod"eme topljakov. **[Scrapers for raising sunken logs.]** *Lesn. Prom.* 1958 (5), (19). [Russ.]

A heavy metal frame fitted with projecting spikes, and having a working width of 5 m., was used to drag sunken logs from the bed of a river used for loose floating, working from bank to bank. On the drag, the scraper was pulled by a heavy tractor, on the return run by a winch. With a 5-man team the unit takes 12–15 min. to do the double haul over a strip 80-100 m. long. Ca. 1·5 cu.m. of timber can be dragged per haul. Large losses of timber have been eliminated, and the method is said to be economical.

619. ÖSTENSSON, D. Felsortering och stycketalskontroll vid skiljeställena i Ume- och Öreälvarna. **[Mis-sorting and check of log counts at sorting points on the Ume and Öre rivers.]** *Årsb. svenska Flottledsförb.* No. 31, 1957 (5580–6). [Sw.]

Checks of sorting made at two sorting points for floated timber in 1955–56 gave the following results: (1) mis-sorting is usually $< 0{\cdot}5\%$, but may be as much as 2%; (2) it is usually less in timber than in pulpwood assortments; (3) the largest assortments and the concerns floating large amounts tend to gain, and smaller assortments to lose from mis-sorting; (4) gains are generally $< 0{\cdot}2$ and losses $< 1\%$, but the latter may be as much as 4 for assortments and 2 for concerns. Checks of the counting of logs at the two points showed that at one the check gave higher, and at the other lower, results than the normal count, differences being largest in groups containing < 5000 logs and least in those containing $\geqslant 300{,}000$. It is concluded that both mis-sorting and mis-counting are negligible.

620. BUCHT, H. Försök med färgmärkning av flottgods. **[Trials of coloured floating marks.]** *Årsb. svenska Flottledsförb.* No. 31, 1957 (5572–9). [Sw.sw.]

Trials over 5 floating seasons have shown that colour markings on the cut ends of logs are satisfactory and improve sorting. Examples of markings for different owners and assortments and of marking equipment and paints are described.

621. MILOV, S. G., and KOŽEVNIKOV, V. G. Mehanizirovannaja vygruzka breven bol'šimi pučkami. **[Mechanized unloading of logs in large bundles.]** *Lesn. Prom.* 1958 (6), (7–8). [Russ.]

Lists the specifications of the L-36 2-drum winch, which has a pull of 15 tons, and is designed for pulling raft bundles of up to 25 cu.m. out of the water, without the need for untying them. The organization of work is described.

622. Selivanov, P. A. Opyt sudovoj perevozki lesa v pučkah. [**A trial of transporting bundles of logs by boat.**] *Lesn. Prom.* 1958 (7), (16–7). [Russ.]

Describes the trial loading at the Stalingrad floating depot of log bundles (averaging 7 cu.m.) by crane into an open, metal barge of sea-going type, loading capacity 3000 tons, length 85 m., beam 14·4 m. In all, 2416 cu.m. of timber were loaded by a pair of Gans cranes in 11 hours. The bundles were shipped to Zhdanov, a port on the Sea of Azov, and unloaded there by crane. Considerable economies of time and labour are claimed for this procedure.

623. [**Inland waterways of Great Britain.**] *Timb. Tr. J.* 226 (4273), 1958 (65, 70, 78).

Reports the debate in parliament on the Report of the enquiry on Inland Waterways (H.M.S.O. 6*s.* 6*d.*). The prospect of timber carriage on the Scottish canals is discussed. Canal transport, because slow, is more costly on a ton/mile per man-hour basis than road transport and may involve extra handling.

38. Forest Engineering

383. Roads and Bridges

See also Nos. 72, 549.

624. [**Forest roadbuilding.**] *Allg. Forstzeitschr.* 13 (26), 1958 (361–85). 7 refs. [G.]

A special number, containing articles on modern methods of maintenance and construction, equipment, costs etc. A description is given (*G. Reissinger*) of the 'chiprake', an implement with rubber tines for the maintenance of protective dressings of loose chips or gravel. An article on the use of bitumen for the revegetation of denuded soil (*J. E. Raeder-Roitzsch*) describes and illustrates American equipment for soil preparation, the spreading of a mixture of mulch and bituminous emulsion from a compressed-air gun, and the spraying of seed and fertilizers in aqueous suspension. Embankments and cuttings with a gradient of 1 in 1, or even 1 in 0·75 and up to 25 m. high can be successfully reseeded in this way. [Cf. *F.A.* 19 No. 400.]

625. [**Forest roadbuilding.**] *Allg. Forstztg.* 69 (13/14), 1958 (167–80). [G.]

A special section, with articles on mechanized roadbuilding in the flatter parts of Lower Austria (*W. Wegwart*); modern bridge construction—steel and reinforced concrete (*F. Auböck*); the [mechanical] construction of road beds (*R. Grabner*) [criticizing existing practices], and on planning the exploitation of forest in Bosnia and Herzegovina (*B. Mihać*) [a description of the work of the 'Suma' planning bureau, including roads, railways, sawmills etc.].

626. Lebrun, R. Construction en régie de routes forestières en montagne: 50 km. pour 60 millions. [**Construction of forest roads in the mountains at State expense: 50 km. for 60 million francs.**] *Rev. for. franç.* 10 (7), 1958 (448–66 + 4 photos). [F.]

Describes the organization, financing, methods and equipment used in roadmaking, in the Vosges. The Administration des Eaux et Forêts executed the manual work by direct labour, but hired equipment and technical personnel for particular jobs. A detailed analysis of costs is given.

627. Gavrilov, I. I., and Zaharov, T. Z. Gruntovo-gravijnaja avtodoroga. [**Earth-and-gravel lorry roads.**] *Lesn. Prom.* 1957 (12), (16–9). [Russ.]

Outlines the methods and machinery used in building such roads, suitable for transport of large quantities of timber in heavy lorries.

628. Blinov, O. S. Potočnoe stroitel'stvo lesovoznyh dorog. [**Streamlining the building of roads for timber transport.**] *Lesn. Prom.* 1958 (5), (21–6). [Russ.]

Describes the making of two earth roads with a large amount of heavy machinery, the work being streamlined so as to proceed without interruption or disorganization. Costs were 35 and 24% below the estimates, largely because of good organization and the use of locally available material such as gravel.

629. Schweigler, W. Maschinelle Wegunterhaltung. [**Mechanized road maintenance.**] *Forstarchiv* 29 (5), 1958 (111–5). [G.]

Describes methods, and equipment of German make to be attached to the Unimog tractor, for grading, trimming edges, moving earth and transporting materials on forest roads. An analysis is made of the total cost of maintenance operations in the forest administrative district of Südbaden for the years 1956–57.

630. Krasnik, M. G., Leonovič, I. I., and Okovityj, A. L. Gidravličeskij rasčet vakuum-cistern. [**Calculating hydraulic pressures for vacuum-tanks.**] *Lesn. Prom.* 1957 (9), (11–3). [Russ.]

Lorries with vacuum-tanks are often used for drawing up water to make ice roads. Detailed formulae for calculating the necessary pressures, correct diam. of suction pipe, tank strength, pressure losses, etc. are developed and explained, with examples of their practical use.

384. Protective Works, including Torrent Training

631. Monnet, P. D'une technique nouvelle en matière de travaux hydrauliques. [**A new technique for hydraulic works.**] *Repr.* from *Technique de l'Eau, Bruxelles* Nov., 1957. pp. 11. [F.]

Describes a lattice-work barrage for trapping and diverting solid matter carried by a torrent.

386. Waterways. Stream Training

632. Sergutin, V. E. O vodopronicaemosti lesosplavnyh damb. [**The permeability of river dams.**] *Lesn. Prom.* 1957 (9), (18–9). [Russ.]

Discusses laboratory investigations on calculating the percolation losses of different types of dam, and the importance of this knowledge when using dams

to narrow (and thus deepen) the flow in a particular stretch of river, or to cut off a part of the river (e.g. one of the channels round an island) to limit non-useful flow.

633. NAZAROV, V. N., and GRIDNEV, M. P. Metalličeskij klapannyj zatvor dlja nizkonapornyh derevjannyh lesosplavnyh plotin. **[A metal, valve-type [sluice] gate for a small head of water, in wooden dams for river driving.]** *Lesn. Prom.* 1957 (8), (17–9). [Russ.]

Illustrates and describes the design of the gate.

4. FOREST INJURIES AND PROTECTION

See also Nos. 228–30, 320–1, 324–5, 328, 330, 333.

634. BÄRNER, J. [Compiler]. Bibliographie der Pflanzenschutzliteratur 1948–1949. **[Bibliography of plant protection literature for 1948–49.]** Biologische Bundesanstalt für Land- und Forstwirtschaft, Berlin-Dahlem. 1958. pp. xli + 689. [G.E.F.]

[Cf. *F.A.* 18 Nos. 4162–3.] Comprises over 21,100 titles.

635. BÄRNER, J. [Compiler]. Literaturquellen und ihre Kürzungen aus der Bibliographie der Pflanzenschutzliteratur. **[Literature sources and their abbreviations used in compiling the Bibliographie der Pflanzenschutzliteratur.]** Biologische Bundesanstalt für Land- und Forstwirtschaft, Berlin-Dahlem. 1958. pp. 167. [G.]

Lists the publications alphabetically under their titles with the place of publication and the abbreviations used.

41. General Technique of Forest Protection. Types of Injury

See also No. 741.

636. Forstschutzmittelverzeichnis. **[Catalogue of chemicals for forest protection.]** *Merkbl. biol. Bundesanst. Land- u. Forstw., Braunschw.* No. 10 (6th ed.) 1958. pp. 12. [G.] Price *DM*.0.20. [Cf. *F.A.* 18 No. 1729.]

637. SCHINDLER, U., DIEKERT, K. H., and SCHNEIDER, G. Erfahrungen mit rückentragbaren Motor-Sprüh- und -Stäubegeräten im Forstschutz. **[Experiences in forest protection with power-driven knapsack sprayers and dusters.]** *Forst- u. Holzw.* 13 (13), 1958 (248–51). [G.]

Lists the specifications of the AS 1 (Fa. Reitter & Schefenacker, Schwaikheim/Württ.), the Fontan (Fa. Motan, Überlingen/Bodensee), and the Solo (Fa. Kleinmotoren, Maichingen b. Stuttgart) knapsack units, all of which can be used for spraying or dusting. Typical examples are given of the time taken by, application rates, fuel consumption, and costs of, successful treatments against various weeds, pests and diseases in different kinds of forest conditions, using data obtained in practical trials.

638. BEVAN, D., DAVIES, J. M., and BROWN, R. M. **Fogging machines.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (72–3).

Further experiments with a Tifa Fogging Machine [cf. *F.A.* 19 No. 707] indicate the importance of having the right weather. It is essential for successful forest fogging to have an inversion provided by radiation and transpiration cooling the air immediately above the canopy. Such a situation will occur only on a still night. In these conditions the fog is sealed under the canopy and an average swathe width of 100 yd. can be relied on. Trials with the standard Tifa and with a pair of small Tifa machines showed the former to be superior.

639. KARSCHON, R. **Tentative key of leaf symptoms in *Eucalyptus gomphocephala* A. DC.** [*Docum.*] *3rd Sess. Wkg. Party on Eucalypts FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/EU 15-Cb*, 1958. pp. 3. 4 refs.

Discusses and describes symptoms caused by Fe and Mg deficiency, CMU soil applications, airborne salt, wind, drought, and mechanical injury to roots. [Cf. *F.A.* 19 No. 3103.]

42. Injuries from Inorganic Agencies other than Fire

See also No. 826.

421. Air Currents

See also Nos. 8, 639.

640. BEYREUTHER. Wipfelköpfung als Windschutzmassnahme. **[Crown topping as a protection against wind.]** *Allg. Forstzeitschr.* 13 (14), 1958 (201). [G.]

Briefly describes a method of crown-topping of dominants on the edges of Spruce stands. The amount removed decreases from 5 m. for the outermost trees to 2 m. at a little distance inside, thus producing a sloping profile which, it is claimed, considerably reduces damage from windthrow.

641. HOUTERMANS. Sturmsicherung durch Wipfelköpfung. **[Storm protection by crown topping.]** *Allg. Forstzeitschr.* 13 (14), 1958 (200–1). 3 refs. [G.]

An illustrated account of the method.

642. SIEBENBAUM. Praktische Erfahrungen mit der mechanischen Verankerung von Sturmrändern. **[Practical experience with mechanical anchoring of the margins of stands exposed to storms.]** *Allg. Forstzeitschr.* 13 (14), 1958 (201–3). [G.]

Confirms the efficacy of using wire ropes (4–5 mm. diam.) for anchoring Spruce [cf. *F.A.* 18 No. 531].

643. CROKER, T. C. **Soil depth affects windfirmness of Longleaf Pine.** *J. For.* 56 (6), 1958 (432).

An investigation of damage in a forest in S. Alabama due to Hurricane Flossy (1956) revealed that 90% of windthrown trees (*Pinus palustris*) were on soil where clay or sandy clay came to within 24 in. of the surface, although only 46% of the forest area was in this soil class.

644. GHENT, A. W. **Mortality of overstory Trembling Aspen in relation to outbreaks of the forest tent caterpillar [*Malacosoma disstria*] and the Spruce budworm [*Choristoneura fumiferana*].** *Ecology* 39 (2), 1958 (222–32). 9 refs.

A study was undertaken to determine the relation of Aspen mortality in the Lake Nipigon forest area of Ontario to the outbreak of *M. disstria* in the late 1930's and to determine what influence Aspen mortality might have had on the exposure, flowering and consequent susceptibility of understorey Balsam Fir and Spruce to budworm attack. The influence of Aspen mortality on flowering of Balsam Fir was confirmed, but it was shown that the elimination of the Aspen overstorey began long before the outbreak of *M. disstria* and was largely due to stem breakage during midsummer gales where the crowns were in full leaf (40% of the overstorey had disintegrated in this way before heavy defoliation began). In this region, where Aspen regularly attains a d.b.h. of ⩾ 25 in., it may be the normal fate of this species to outgrow its structural limitations. Death of overstorey Aspen was accompanied by establishment of *Acer spicatum* shrub growth which was probably responsible for the absence of Aspen sucker reproduction. The suggestion that the progress of overstorey elimination was accelerated by *M. disstria* defoliation [cf. *F.A.* 12 No. 3467] and that the succession of the coniferous component of these stands was hastened in this way, receives no support from this study.

422. Temperature Influences. Frost. Heat. Drought

See also Nos. 151–3, 235–7, 379, 434, 639, 827.

645. PETRESCU, L. Vătămări cauzate de ger în arboretele de plopi negri hibrizi. **[Frost injury in plantations of hybrid Black Poplars.]** *Rev. Pădurilor* 1958 (4), (214–5). 3 refs. [Rum.]

Describes injuries caused by the severe frost of 1952 (down to − 18° C. in March) in 19-year-old plantations of *Populus* × *euramericana* on deep alluvial soils at 80 m. alt. Ca. 30% of the trees displayed frost cracks—17% typical and 13% superficial.

646. OKSBJERG, E. Udspringstid og tørketålsomhed. **[Date of flushing and drought tolerance.]** *Dansk Skovforen. Tidsskr.* 43 (6), 1958 (292–307). 9 refs. [Dan.dan.e.*e.*]

Continued observations on young Norway Spruce [see *F.A.* 19 No. 534] showed that height increment of early-flushing trees was again significantly greater than that of late-flushing ones in 1956 and 1957. In a 40-year stand 8 km. west of that already examined, increment of 6 early- and 7 late-flushing trees was determined for the period 1941–1957. Both height and diameter increment (the latter at half tree height), were reduced in the dry year 1947 in all trees; in 1948 and 1949, increment of the late-flushing trees was again normal whereas that of early-flushing trees was still subnormal. Results of comparison of the growth of a plot of very early-flushing Norway Spruce with that of a very late-flushing plot of *Picea orientalis* and early- and late-flushing Spruce of German provenance are shown in graphs and discussed but no clear conclusions on relation of date of flushing and increment emerged.

647. HOFSTEN, E. v., and LINDSTEDT, M. Torkskador. **[Drought damage.]** *Skogen* 45 (11), 1958 (340, 343). [Sw.]

Estimates the extent of the damage and financial loss in AB Gustavsbergs Fabrik's forests on Värmdö near Stockholm, caused by the drought of June–Aug. 1955 [cf. *F.A.* 18 No. 2959].

648. **Drought, mortality, and diameter growth.** *Rep. Stheast. For. Exp. Sta. 1957*, 1957 (16–7).

In a 10-week drought in summer 1954 in Georgia, Loblolly and Shortleaf Pine suffered heavy losses, particularly on shallow soils. Increment in 1954 was about half that in 1953, the loss being mainly in late wood, and in 1955, a normal year, early-wood formation was still depressed, though late-wood formation was normal.

424. Soil Conditions. Erosion Effects. Nutrient Deficiencies etc.

See also Nos. 100, 242, 273–4, 348, 486, 639, 832.

649. VIRO, P. J. Kloridi-ionin myrkkyvaikutuksesta. **[On the toxicity of the chloride ion.]** *Commun. Inst. for. Fenn.* 48 (3), 1956 (1958). pp. 16. 9 refs. [Fi.e.*e.*]

The dying of Scots Pines along a road treated with $CaCl_2$ (to prevent dust) was investigated. Needles even of apparently healthy trees growing within 0·5 m. of the road were found to contain 50% more chloride than those growing 8–15 m. away from the road. The content was still higher in yellow needles from affected trees. [Cf. *F.A.* 16 No. 595.]

650. KARSCHON, R. **Investigations on iron chlorosis in *Eucalyptus gomphocephala* A.DC.** *La-Yaaran* 8 (1/2), 1958 (6–9, 32–30). 6 refs. [Heb.E.heb.e.]

The symptoms resemble those in *E. rostrata* [cf. *F.A.* 18 No. 2963]. The disorder occurs in soils with high levels of active lime and exchangeable Ca. Affected leaves usually contain more ash and Ca than green leaves. Chlorotic trees respond, at least temporarily, to the addition of Fe compounds either to the soil or by injection in the bole.

425. Chemical Influences (Atmospheric)

See also Nos. 525, 639, 830.

651. WENTZEL, K. F. Feststellung und Bewertung von Waldrauchschäden. **[The diagnosis and financial evaluation of smoke damage to forests.]** *Forsch. u. Berat.* (*Forstw.*) *Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 3, 1958 (109–20). 4 refs. [G.]

A general discussion of the numerous factors involved and the methods available. While no single visible symptom is in itself sufficient evidence, a combination of symptoms supported by foliar and air analyses can furnish satisfactory proof, though in industrial areas like Rhineland-Westphalia it may be difficult or impossible to ascertain differences in

habit, growth etc. by reference to unaffected stands on comparable sites. The total affected forest area in the state is estimated at 40,000 ha. with ca. 25,000 ha. (mostly conifers) actually damaged. The injurious influence of the Ruhr district has been found to extend 15–20 km. to the N. and E. The discussion of valuation principles is very general.

652. PELZ, E. Erfahrungen mit dem Trübungstest nach Härtel bei der Rauchschaden-diagnose an Fichte. [**Results with Härtel's turbidity test for the diagnosis of smoke damage in Spruce.**] *Arch. Forstw.* 7 (2), 1958 (105–12). 10 refs. [G.g.russ.e.]

[Cf. *F.A.* 16 No. 3779.] Further tests of the turbidity, on cooling, of boiling-water extracts of Spruce leaf wax confirm increasing turbidity values (t.v.) as the source of smoke is approached and a greater dispersion of t.v. as the SO_2 content of the air is raised. Because of the great dispersion of t.v., however, many samples are required to reveal trends. In apparently unaffected Spruce in Saxony it is more than the $\pm$ 1% found by Härtel. Industrial smoke emissions so densely cover one another in this region, that there are scarcely any areas without air pollution, and a relation probably exists between this continuous influence of smoke and SO_2 and the dispersion of t.v. values. *From author's summary.*

653. KELLER, H. Beiträge zur Erfassung der durch schweflige Säure hervorgerufenen Rauchschäden an Nadelhölzern. [**On smoke damage to conifers caused by SO_2.**] *Forstwiss. Forsch.* No. 10, 1958. pp. 63. 55 refs. [G.g.e.]

Part I [37 pp.] deals with investigations on the SO_2 content of the air, made at Munich, Marienstein and Tettau with the Jonoflux gas detector, which records to an accuracy of 0·01 mg. SO_2/cu.m. of air. At all sites, peak values of $>$ 2·5 mg./cu.m. were recorded. Part II reports on investigations into the influence of artificially applied SO_2 on the gas exchange of young Fir, Spruce and Pine under laboratory conditions. The rates of assimilation, respiration and transpiration were recorded, with the URAS (Infra-Red Absorption Recorder) and the Thermoflux apparatus, when 4–6 mg. SO_2/cu.m. was applied, and the results compared with those of untreated controls. The net assimilation of treated plants decreased sharply from the very start of treatment, whereas respiration and transpiration were initially stimulated, the assimilation/transpiration ratio then falling rapidly. This test is the earliest and most sensitive so far devised for assessing smoke damage.

654. GISIGER, L. Die Fluorschäden im Gebiete Rheinfelden und Möhlin. [**F injuries in the Rheinfelden/Möhlin region.**] *Mitteilungen für die Schweizerische Landwirtschaft, Zürich* 3 (6), 1955 (81–91). [G.] C.G.B.

Includes observations on Pine, Yew, Hornbeam, Beech, Walnut, and Horse Chestnut, all of which are classed as highly susceptible. Tabulated data show extensive scorch and greatly increased F contents of foliage for most of these up to a distance of 3–4 km. from the offending aluminium works in Baden, near the Swiss frontier, after open furnaces had been introduced.

655. BIEBERDORF, F. W., *et al.* **Vegetation as a measure indicator of air pollution. Part I. The Pine (*Pinus taeda*).** *Bull. Torrey bot. Cl.* 85 (3), 1958 (197–200). 6 refs. O.B.D.

Presents the results of analyses of leaves for SO_4 and Na from samples taken in areas of industrial activity in Harris County, Texas. It was found that a study of SO_4 concentration in leaves from different areas gave a good indication of the pollution pattern regardless of the agent or agents responsible.

426. Electrical and Cosmic Influences

See No. 657.

43. Forest Fires

656. NELSON, R. M., and BRUCE, D. **Forest fire research needs in the South [of the U.S.A.].** *J. For.* 56 (6), 1958 (399–403).

Pleads for far more research on all aspects of forest fires: ignition and combustion; fuel characteristics; weather and fire behaviour; measurement of fire danger; prevention and suppression; direct and indirect effects of fire; techniques of using fire; and fire-control planning.

431. Predisposing Factors and Causes. Fire Danger. Fire Behaviour

657. BENNETT, W. D. **The control of lightning-caused forest fires.** *Woodl. Res. Index Pulp Pap. Res. Inst. Can.* No. 106, 1958. pp. 30. 24 refs.

A general account of the importance of lightning as a cause of forest fires, and of its nature. Predisposing factors, recognition of meteorological conditions preceding the occurrence of lightning, prevention of the occurrence of lightning, fire suppression, and measures to reduce damage are reviewed, and recommendations made for a complete programme of lightning and lightning-fire research for Canada. An appendix contains 161 references (mainly Canadian and U.S.) on lightning, weather modification, and the control of forest fires caused by lightning.

658. MASUDA, H. [**On the measurements of speed of fire-spread in a Bamboo grass (Miyakosasa) area.**] *Spec. Rep. For. Exp. Sta., Hokkaido* No. 8, 1957 (168–76). 9 refs. [Jap.jap.e.*e.*]

Shows, with meteorological data and fire-progress maps, the rate of spread in plots where (*a*) all Sasa [*Bambusa nipponica*] was removed, (*b*) Sasa was removed in 2-m. strips 2 m. apart, (*c*) as (*b*) but 3 m. apart. The area burned, S (sq.m.), equalled for (*a*), (*b*), and (*c*) respectively, $3{\cdot}733e^{0{\cdot}0055t}$, $4{\cdot}698e^{0{\cdot}0053t}$, and $5{\cdot}995e^{0{\cdot}0068t}$, e being the base of natural logarithms and t being elapsed time in minutes.

432. Prevention and Control

See also No. 481.

659. WOOD, R. F., and HOLMES, G. D. **Control of vegetation in fire traces.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (41–2).

A large experiment was established in 1956 on

firebreaks in 3 forests in S. England in order to assess the value of a selected range of weedkillers and application rates as a possible means of replacing or supplementing cultivation methods for eradicating perennial grasses and herbaceous species. Assessments to date indicate that complete ploughing without chemical treatment is effective in disposing of tussock grass and non-rhizomatous herbs, but the majority of weeds, especially rhizome-forming grasses, *Juncus* spp., and dicotyledons, regenerate rapidly. Most of the weedkillers tried were selected as being total non-selective plant poisons, with the object of securing a complete kill and maintaining bare soil for as long as possible. Of these, borax formulations were particularly effective, especially 'concentrated borascu' at rates of $\geqslant$ 15 cwt./acre. CMU was disappointing and rates of $>$ 50 lb./acre were necessary to maintain near-sterile soil conditions for a full season. Na arsenite at 1·5–6 cwt./acre gave high initial kill, but recovery was rapid; similar effects followed $NaClO_3$ at rates up to 6 cwt./acre.

660. **[The use of helicopters in fire control.]** *Fire Control Notes* 19 (2), 1958 (74–96).

Several short articles on the equipment of helicopter bases, accessories (water tanks, hose-laying equipment etc.) for fire-fighting helicopters, training of crews etc.

661. WILSON, C. C. **Control of aircraft on forest fires [in California.]** *Fire Control Notes* 19 (2), 1958 (35–9).

662. WINKWORTH, R. C. **Aircraft support of fire control in North Carolina.** *Fire Control Notes* 19 (2), 1958 (40–4).

663. **Water-dropping from float-equipped planes.** *Fire Control Notes* 19 (2), 1958 (47–52).

Describes the installation of a 6-ft.-long, 90-gallon rotating tank, filled in 10 sec. in flight, on each float of a De Havilland Otter, by the Air Service Division of the Ontario Department of Lands and Forests. The primary aim was 'to drop the greatest possible amount of water in the shortest possible time with a minimum delay in pick-up and assembly, the whole operation to be handled by the pilot'.

664. MCDONALD, L. J., and EMERSON, W. J. **Water dropping from seaplanes on the Superior National Forest.** *Fire Control Notes* 19 (3), 1958 (123–6).

Describes the adaptation and operation of a De Havilland Beaver fitted with a 125-gal. tank with water pick-up tube and release gate (illustrated), that can fill up while skimming the surface of the water. [Cf. *F.A.* 19 No. 4358.]

665. BANKS, W. G. **Airplanes for direct attack on forest fires in the Northeast.** *Fire Control Notes* 19 (2), 1958 (45–6).

Urges their trial use in the 4 million acres of droughty coastal plain between Maine and Maryland, using both water and chemical retardants.

666. BEEMAN, R. M. **1957 Aerial-tanker project for Region 6.** *Fire Control Notes* 19 (2), 1958 (57–62).

Describes a pilot aerial-tanker project in the Wenatchee National Forest, using a Stearman and a Piper Super Cub, to drop water or borate slurry on fires in a variety of fuels and topographical sites. Particular success was achieved in grass and sagebush fires. Tactics to be employed in different kinds of fire are outlined.

667. HARRIS, H. K. **Fighting fires with airplanes and sodium calcium borate in Western Montana and Northern Idaho—1957.** *Fire Control Notes* 19 (2), 1958 (66–7).

Tabulates flight time, character of fire, and results of dropping Na Ca borate in water on 8 fires of different types. General results were encouraging, especially where there was not a heavy tree canopy. Cost of borate, applied on the fireline, averaged $280.00 per fire.

668. MILLER, H. R., and REINECKER, H. P. **Air tanker report—California, 1957.** *Fire Control Notes* 19 (2), 1958 (53–6).

Discusses effectiveness and costs, on the basis of analysis of data on 101 fires on which air tankers were used. They were completely effective on ca. 25% of fires, partially effective on 65% and non-effective on 10%. They were generally most effective in initial attack. Dropping of borate to make fire-lines was carried out, as well as fire-fighting with water.

669. LAFFERTY, G. E. **The air tanker as an initial attack tool.** *Fire Control Notes* 19 (3), 1958 (120–2).

Notes on the use, in Boise National Forest, of a Ford Tri-motor aeroplane rigged for aerial spraying and converted to an air-tanker by the addition of 19 $\times$ 20-in. free-swinging gates to the bottoms of the spray tanks. The tanks carried 500 gal. of water-suspended Ca borate. Operations were successful in stopping the spread of fire in light fuels and keeping fire on the ground in heavy fuels.

670. KERNIK, J. L. **The Ozark Swatmaster—a swatting tool for grass fires.** *Fire Control Notes* 19 (3), 1958 (107).

An adaptation of previous swatters, with some innovations. Water in a back-pack can is used sparingly to keep the swatter wet. The water flows through a $\frac{1}{4}$-in. conduit, 5 ft. long, which forms the handle of the swatter, and is controlled by a valve 1 ft. from the end.

435. Benefits of Fire Control. Injurious Effects of Fire

See also Nos. 72, 261, 672, 716, 733.

671. PREBBLE, M. L., and GARDINER, L. M. **Degrade and value loss in fire-killed Pine in the Mississippi area of Ontario.** *For. Chron.* 34 (2), 1958 (139–58). 5 refs.

Study of the effects of the Mississippi fire of May 1948 showed that *Pinus strobus* and *P. resinosa* that suffered only light or moderate fire injury, had

sustained relatively light damage from insects or fungi by Nov. 1949, and were mostly salvable. Trees that were severely burned or killed outright, however, were heavily attacked by borers and stain fungi, average value loss for *P. strobus* being 17·2% for low-quality and 58·8 for high-quality logs, and for *P. resinosa* 13 and 17·3 respectively.

436. Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry

See also No. 350.

672. DELVAUX, J. Effets mesurés des feux de brousse sur la forêt claire et les coupes à blanc dans la région d'Élisabethville (1950–1951 à Octobre 1955). **[Measured effects of fire in the dry [*Brachystegia*] forest and in clear fellings in the Elisabethville region, 1950–55.]** *Bull. agric. Congo belge* 49 (3), 1958 (683–714). [F.du.]

Twenty-seven 0·5-ha. plots in 30- to 35-year *Brachystegia* forest, carrying ca. 255 steres (of 0·5 cu.m.) solid wood/ha. were replicated in 1956 to: (*A*) untreated controls; (*B*) clear felled with stump height < diameters; (*C*) clear felled, leaving stumps of 60–80 cm. (native farm method). Each of these were subjected to: (1) complete protection; (2) early burning (at the beginning of the dry season as soon as a grass fire runs freely); (3) late burning (just before the rains, when trees are in full vernal growth). Measurements were made in 1953 and 1955, the following data being tabulated: for (*A*) diameters and b.a. by classes: for (*B*) and (*C*), number of stems (root suckers, coppice shoots and seedlings) by 1-m. height classes. Practical conclusions are: that treatment (3) should be proscribed; that (1) is so little superior to (2) and the damage done by accidental fire is so great, that this method is impracticable; that a later application of (1) in an area hardened to fire by (2) is always possible; that (*C*) is justified for reconstituting fallows where fires are not controlled (more stems, but deformed); and that early burning eliminates almost all risk of accidental burnings, hardens the stems to fire and early favours the best stems by eliminating the worst.

44. Damage by Harmful Plants. Virus Diseases

441. Weeds

See also Nos. 99, 432, 489, 510–1, 515, 659, 693.

673. POTTS, S. F. **Silvicide equipment and methods for use along power lines and in forest management.** *Trees Mag., Ohio* 18 (5), 1958 (7, 28–9, 34).

Notes on methods and equipment for applying weedkillers to brush, unwanted hardwoods etc.; with descriptions and prices of knapsack sprayers and mist blowers.

674. BRAMBLE, W. C., BYRNES, W. R., and HUTNIK, R. J. **Effects of chemical brush control upon game food and cover [on a powerline right of way].** *Progr. Rep. Pa. agric. Exp. Sta.* No. 188, 1958. pp. 7. 5 refs.

675. OINONEN, E. Sanajalan torjunnasta. **[Bracken control.]** *Metsät. Aikak.* 1958 (6), (179–83). 10 refs. [Fi.e.]

Reviews results of Scandinavian, German and British research on mechanical and chemical control. $KClO_3$ and $NaClO_3$ have given the best results so far in chemical control, but any disadvantages have not been sufficiently examined.

676. KENTEN, R. H. **Bracken thiaminase.** *Rep. Rothamst. exp. Sta. 1957*, 1958 (242–51). 23 refs.

Describes investigations with a view to synthesizing substances of analogous structure to essential metabolites of bracken, which could be used to destroy the bracken by a competitive antagonism of the essential metabolite. A start has been made on the synthesis of compounds that may be of value, and experiments have shown that ABMT (3-(*o*-aminobenzyl)-4-methylthiazole) is a powerful inhibitor of thiaminase *in vitro*, though apparently without effect on the bracken plant.

677. JERMANOVA, H. Erfahrungen mit der Verwendung eines Naphthaderivates zur Unkrautbekämpfung in Nadelbaumschulen. **[Results from the use of a petroleum derivative for weed control in conifer nurseries.]** *Z. PflKrankh.* 65 (5), 1958 (268–72). 10 refs. [G.g.e.] E.M.B.

Of various products of mineral-oil refineries tested, a petroleum distillate (b.p. 149–205° C., sp. gr. 0·795) from Austrian paraffinic crude oil gave the best results. Its effect on seedlings of Spruce, Pine, Silver Fir, Douglas Fir and European Larch was tested in the greenhouse and in the nursery. Spruce was the most and Fir and Larch least resistant. Spraying at 1000 litres/ha. immediately after germination, when the seedlings were protected by the seed-coat, did little damage, but 2–5 weeks later was definitely harmful; spraying at 600 litres/ha., 2–5 weeks after germination, scorched the needles slightly, and 6–8 weeks later did serious damage. One-year-old seedlings were more resistant, Pine and Douglas Fir plants tolerating 800 litres/ha., and Spruce 1000 litres, without damage. Resistance of weeds was dependent on species and stage of development. Most weeds were killed by 600 litres/ha. when they had 2–3 leaves, but older stages needed 1000 litres. *Agropyron repens*, *Cirsium arvense*, *Hypericum perforatum*, *Senecio vulgaris* and *Rubus* sp. were damaged but not killed, and *Daucus carota* was extremely resistant. Costs, at all rates of spraying, were well below those for hand weeding.

678. BYLTERUD, A. Ugrasbekjempelse med kjemiske midler på plantefelter. **[Chemical control of forest weeds in plantations.]** *Norsk Skogbr.* 4 (11), 1958 (347 . . . 56). [Nor.]

The main part consists of sections on the methods, time, costs etc. of treatment and chemicals recommended for different groups: (1) coppice growth of trees and shrubs; (2) heather, *Vaccinium myrtillus* etc.; (3) tall herbaceous plants; (4) bracken and ferns; (5) grasses.

679. ROGERS, N. F. **Airplane-sprayed herbicides release Shortleaf Pine from hardwoods.** *Sta. Note Cent. St. For. Exp. Sta.* No. 117, 1958. pp. 2.

A solution of 2,4,5-T or 2,4,5-TP acid in fuel oil at a rate of 2 lb./5 gal./acre was applied aerially in June–July to Pine/hardwood forest in Missouri. Both herbicides were effective, causing an average of 90% defoliation of the hardwood trees during the first growing season; ca. 50% of the defoliated trees died after 2 years and many of the rest are of low vigour and expected to die. No Pine trees were killed; some lost up to 75% of their needles, but all developed new needles during the same growing season. On areas released by aerial spray the Pines grew 50% more during the second growing season than unreleased Pines. Treatments cost $7.55/acre over a 40-acre area and $4.92/acre on an 800-acre area vs. $12.50–25/acre for hand methods.

680. CONSTANTIN, S., Despre degajările aviochimice. **[Chemical control of invading hardwoods from the air.]** *Rev. Pădurilor* 1958 (2), (80–4). [Rum.russ.g.f.e.]

Describes successful trials in June 1955 and Aug. 1956 of control of Birch, Alder, Willow etc. invading young conifer plantations, by aerial spraying with 2,4-D or 2,4,5-T. Tabulated data on concentrations and rates of application, types of aircraft used, and costs, are given.

681. SCHRÖFL, J. Die chemische Unkrautbekämpfung mit Versuchen über die Empfindlichkeit von Fichtenpflanzen gegenüber verschiedenen Herbiziden. **[Chemical weed control, and tests on the susceptibility of Spruce plants to different herbicides.]** *Allg. Forstztg.* 69 (15/16), 1958 (193–6). 4 refs. [G.]

A general discussion on the mode of action of the main types of herbicide, containing many (mainly German or Austrian) proprietary names and a table of susceptibility of the main weeds, including shrubs and even forest trees, to preparations of (*a*) MCPA, (*b*) 2,4-D, (*c*) 2,4,5-T and (*d*) di-nitro bases. In tests on 4-year-old Spruce with 150 c.c. of (*a*)–(*d*) and with Na TCA in normal and multiple doses, tolerance was high to (*b*), slightly less to (*a*), still less to (*c*), and very poor to (*d*). With growth regulators, the previous year's shoots showed signs of injury before the current year's growth.

682. HULL, H. M. **Anatomical studies demonstrating phloem inactivation and its dependency upon the interaction of concentrations of 2,4,5-trichlorophenoxyacetic acid and an anionic wetting agent.** *Abstr.* in *Plant Physiol.* 32 (Suppl.), 1957 (xliii). O.R.E.

When central leaves of *Prosopis juliflora* seedlings were treated with 800 or 8000 p.p.m. (acid equivalent) 2,4,5-T combined with 0·1–2·3% of a wetting agent, cross sections of the stems showed incipient proliferation of phloem parenchyma after 48 hours, only when low concentrations of both had been used. After 15 days, profuse cell division with resultant crushing of sieve tubes etc. occurred with all but the highest concentration of both. These observations, combined with studies of growth repression and petiole mortality, suggest that phloem inactivation at the treated spot is directly, but its progress towards root and apex inversely, correlated with concentration.

683. DAVIS, J. R. **Diluted 2,4,5-T more lethal than undiluted in East Texas.** *J. For.* 56 (7), 1958 (516).

Statistically designed and evaluated experiments showed that, for the inhibition of coppice regrowth from freshly cut *Quercus stellata* and *Liquidambar styraciflua*, 2,4,5-T applied during the growing season was more effective when diluted with diesel oil than when undiluted, provided that the amount of acid equivalent in each dose was the same. A double dose of undiluted chemical was nearly as good as the dilution.

684. HOUGH, A. F., and HUNTZINGER, H. J. **A test of measured dosages for chemical control of Allegheny hardwoods.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 104, 1958. pp. 11. 4 refs.

On the Kane Experimental Forest, Pa., strips were mown in hardwood regeneration (0·5–1·5 in. diam. at root collar) in May 1955, and herbicides applied to the cut surfaces. Stools of *Betula lenta* and *B. lutea* were killed by cutting (by Sept. 1956) and needed no herbicidal treatment. Coppice regrowth of *Fagus grandifolia* was almost entirely prevented by 1 or 2 lb. 2,4,5-T/100 gal. kerosene at 4 c.c. per stool, applied after cutting in May and July, and *Prunus serotina* coppice regrowth by 8 c.c. per stool of 2,4,5-T at the 1 lb./100 gal. concentration. Young standing trees of all species were much more resistant to treatment than stools; crown kill or severe crown injury needed dosages of ≮ 16 c.c. per sapling of 2,4,5-T at 4 lb./100 gal. kerosene.

685. **Chemical spraying to control gallberry [*Ilex coriacea*].** *Rep. Stheast. For. Exp. Sta. 1957*, 1957 (70–1).

Experiments to control the shrub in order to improve forest pasture in Southern Pine woods, using 2,4,5-T in water or diesel oil sprayed in May, August or November, indicated no difference between dosages of 2 or 4 lb. acid equivalent per acre, with or without previous burning. Survival rate was lowest for November spraying with diesel oil (20%) and August spraying in water (24%).

686. PHILIP, M. S. **Arboricide research in Karamoja.** *Tech. Note For. Dep. Uganda* No. 5/58, 1958. pp. 3.

Dry-season basal spraying (encircling the bole) with 0·5% butyl 2,4,5-T in diesel oil was highly lethal to scrub of *Acacia* (6 spp.), *Commiphora* spp., *Lannea* spp., *Ipomoea* and *Sansevieria*. One *Commiphora* sp. and one *Lannea* sp. were resistant. Cutting *Acacia pennata* thicket down and then spraying, was distinctly less successful than spraying uncut growth. Using 2–12 gal./acre at 3·80 *s.*/gal. and 0·5–4 man-days/acre at 1·80 *s.*/man-day, the total costs are likely to be 20–55 *s.*/acre, depending on the density of the bush, the number of stems, and the type of growth (separate stems or clumps).

687. NARAYANAN, T. R., and THYAGARAJAN, N. M. **Making short work of Lantana.** *Indian Fmg.* 8 (1), 1958 (14). O.R.E.

Describes experiments in the control of *Lantana camara*. The best effect was obtained with 2,4,5-T at 20 lb. in 150 gal. liquid per acre after the plants had been cut back to 2 ft. from the ground.

688. **[Control of Japanese Honeysuckle (*Lonicera japonica*).]** *Shade Tree* 31 (7), 1958 [2–5].

This introduced species has become a pest in the eastern coastal states of the U.S.A., completely preventing regeneration in some woodlands. It provides good winter grazing for cattle and deer, but this is not enough to destroy it completely. Experiments have been in progress with several chemicals, and promising results have been obtained by applying an early summer spray of 10 lb./acre of 50% aminotriazole, followed by a late summer or early spring re-treatment at lighter volume.

442. Parasitic (Higher) Plants. Epiphytes. Climbers

See also Nos. 163, 693.

689. GILL, L. S. **Dwarf-mistletoe of Lodgepole Pine [*Arceuthobium americanum*.]** *For. Pest Leafl. U.S. For. Serv.* No. 18, 1957. pp. 7. 3 refs.

A general account of the parasite, damage caused, and control.

690. HAWKSWORTH, F. G. **Survey of Lodgepole Pine dwarfmistletoe on the Roosevelt, Medicine Bow, and Bighorn national forests.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 35, 1958. pp. 13. 7 refs.

A reconnaissance of all passable roads through Lodgepole stands in 12 ranger districts in 3 national forests in Colorado and Wyoming showed *Arceuthobium americanum* to be present on 51% of the total area surveyed and more widespread on cut-over areas than on virgin stands in all districts.

691. HAWKSWORTH, F. G. **Rate of spread and intensification of dwarfmistletoe in young Lodgepole Pine stands.** *J. For.* 56 (6), 1958 (404–7). 4 refs.

Studies in Colorado and Wyoming in 33 burned-over Lodgepole stands showed that, in ca. 20 years, *Arceuthobium americanum* had spread < 30 ft. from the residual mature stand into the regeneration area, and in 30 years ca. 30–45 ft., depending mainly on the density of the young stand. Spread was 1·5 times as rapid in stands in which the canopy had not closed as in those where it had. In 20-year stands, ca. 10% of the trees within 30 ft. of an infested mature stand were infested; in 30-year stands, ca. 35%. Methods of managing fellings to achieve optimum control of *A. americanum* are discussed.

443. Fungi and Bacteria

See also Nos. 164–5, 281, 767, 826.

692. BAGCHEE, K. **Diseases of forest trees in India—causes, effects and methods of prevention.** *Indian For.* 84 (7), 1958 (407–17). 18 refs.

Summarizes progress in the study of Indian forest tree diseases, 1953–58.

693. BENBEN, K. Badania nad chorobami topól w Polsce wywołanymi przez czynniki organiczne. **[Studies on Poplar diseases caused by organic agents in Poland.]** *Roczn. Nauk leśn.* No. 19, 1957 (63–122). 61 refs. [Pol.russ.e.]

Agents studied in field and laboratory investigations included fungi, bacteria, viruses, other parasitic plants and weeds, to a total of 94, causing damage to > 100 species and varieties of Poplar. Nurseries and the youngest plantations were most affected. The data are tabulated.

694. CAMPANA, R. J. **A layman's method of diagnosing tree troubles.** *Trees Mag., Ohio* 18 (5), 1958 (16, 20, 24–5).

Discusses the possibility of a general key to all tree diseases, and gives a specimen of a small key covering several common diseases of Elms using a simple comparative approach restricting comparisons to single pairs of characters.

Fungi and Bacteria: Chemical Control

See also Nos. 636, 713, 737, 741.

695. GAUDIAN, B., and GOEZE, G. **Improved fungicides.** *Brit. Patent* No. 796,399, 1958. pp. 2. P.R.

The invention claimed is the addition of small quantities of Zn salts to Cu compounds, which is said to increase the efficiency of the latter and to effect considerable economies in the quantities needed for treating crops. The quantities of Zn used (3–4% of the complete fungicide) are too small to injure the plants.

696. MAY, C., PALMER, J. G., and HACSKAYLO, E. **Inhibition of growth of *Ceratocystis* [*Ceratostomella*] *ulmi in vitro* by residues from extracts of soils and of plants growing in soils treated with captan or Orthocide 50 W.** *Plant Dis. Reptr.* 42 (5), 1958 (696–702). A.P.B.

A preliminary study was made of the possible absorption of captan from the soil by several species of plants. *Ceratostomella ulmi* was found to be very sensitive to captan *in vitro*. Residues of acetone extracts from leaves or stems were tested by bio-assay on agar plates inoculated with *C. ulmi*. Greater inhibition of the fungus *in vitro* regularly occurred round residues from several species of plants growing in soil treated with captan when the rate was between 1 and 10 lb./25 sq. ft. than when the rate was 0·1 lb. or when the soil was not treated. Captan was not identified in any extract, but circumstantial evidence indicates that it or a closely allied chemical was present in the extracts from plants growing in a treated soil. Inhibitory residues were obtained from humus-containing soils in the greenhouse and in the field several months after application of captan. *From authors' summary.*

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See also No. 413.

697. PAWSEY, R. G. **Research on *Keithia thujina*.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (100–2).

Two overwintering stages have been observed in

the life cycle: (1) the retention of incipient apothecia on infected leaves, which in the spring mature and discharge their ascospores; (2) the overwintering of dormant spores on the surface of leaves. It is considered probable that (2) is the main source of heavy spring infections.

698. BIGGS, P. **Studies on *Meria laricis*, needle-cast disease of Larch.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (102–4).

Studies in culture have led to the reduction of 8 strains previously recognized to 4. Indications are that the spores will germinate under a wide range of temperatures. In artificial-inoculation experiments, disease symptoms developed more rapidly on *Larix decidua*, followed by appearance on *L.* × *eurolepis* and finally on *L. leptolepis*. There are indications that primary infection always occurs on *L. decidua*.

699. **[Root rot in Southern Pine seedlings.]** *Rep. Stheast. For. Exp. Sta. 1957*, 1957 (37).

Inoculation experiments indicate that *Fusarium oxysporum* and *Sclerotium bataticola* play roles in causing black root rot and that their effects, such as cortical hypertrophy, may take place without their actually penetrating the root tissue.

700. GILL, D. L. **Effect of root-knot nematodes on *Fusarium* wilt of Mimosa.** *Plant Dis. Reptr.* 42 (5), 1958 (587–90). 5 refs. A.P.B.

Albizzia julibrissin seedlings were grown (1) in uninfested soil, and in soil infested with (2) *Fusarium oxysporum* f. *perniciosum*, (3) *Meloidogyne incognita* or *M. javanica*, or (4) *F. oxysporum* f. *perniciosum* together with either *M. incognita* or *M. javanica*. More wilting occurred in (4) than in (2). Soil (3) reduced seedling size; *M. javanica* produced an abundance of root galls, *M. incognita* only a few. *From author's summary.*

701. UROŠEVIĆ, B. Mykoflora skladovaných žaludů. **[The mycoflora of stored acorns.]** *Práce výzkum. Úst. lesn. ČSR* No. 13, 1957 (149–200). 38 refs. [Cz.russ.f.]

Gives an account of studies made in the winter of 1955 on > 21,000 kg. of *Quercus robur* acorns variously stored in 9 localities in Czechoslovakia. The main objects were to test the efficacy of the storage methods and to study the mycoflora developing on stored acorns. The best results (mean loss 5–7%) were given by cellar storage in sand. Some frost damage occurred with most outdoor methods of storage, but none in trenches or cellars. Acorns stored in pits, especially when deep, were liable to damage by spontaneous overheating. Of insect pests, the most important were *Balaninus glandium*, *Laspeyresia splendana* and *L. grossana*. Parasitic or semi-parasitic fungi found on the acorns were: *Sclerotinia pseudotuberosa*, *S. libertiana*, *Ophiostoma* sp. [cf. *F.A.* 18 No. 4216; 20 No. 702], *Gloeosporium quercinum*, *Phomopsis quercella*, *Cytospora intermedia*, *Schizophyllum commune*, *Botrytis cinerea* and *Pestalozzia truncata*. The saprophytic flora included species of *Penicillium*, *Rhizopus*, *Fusarium*, *Alternaria*, *Trichoderma*, *Arthrobotrys*, *Stysanus* etc.; this group of fungi is not very important under good storage conditions. The development of the mycoflora was found to depend on the time and method of storage. The occurrence and degree of damage by the two groups of fungi depended on the moisture content of the stored acorns. Moulds predominated over parasitic fungi when the m.c. was reduced, e.g. by drying before storage, and mass growth of moulds is often seen on acorns so dried and stored in sheds etc. without sand or in sand that is not moist enough. Correct storage in coarse, moist sand will rid the acorns of mould growth. None of the storage methods can prevent damage by parasitic fungi, especially *Sclerotinia pseudotuberosa*; losses from the 'mummification' caused by this species in preliminary and main storage varied in the winter of 1955/56 from 8% in cellars to 23% in trenches. Until suitable chemical treatments can be devised, great attention should be paid to preventive hygiene, e.g. cleaning debris from seed stands; reducing the collection period to the shortest possible time in stands where *Sclerotinia* occurs; chemical control of insect pests; protection from frost, drying out and mechanical injury during transport; floating to separate damaged acorns, both before and after storage; separate storage of different lots of acorns; storage at − 2 to + 3° C., with a m.c. of ca. 45%.

702. UROŠEVIĆ, B., and JANČAŘÍK, V. Některé závažné choroby dubových semenáčků ve školkách. **[Some important diseases of Oak seedlings in nurseries.]** *Práce výzkum. Úst. lesn. ČSR* No. 13, 1957 (93–123). 14 refs. [Cz.russ.f.]

A survey is made of the most widespread parasitic and saprophytic fungi found in recent years, especially 1956, on Oak seedlings in Czechoslovakia. Special attention is given to a new disease caused by *Ophiostoma* sp., the pathogenicity of which was established by artificial infection trials. In very young seedlings, before leaves are formed, the symptoms are the same as those of the previously reported 'black rot' of acorns [see *F.A.* 18 No. 4216]. In older seedlings with lignified stems the symptoms —discoloration and drying of leaves, accompanied by the formation of tyloses and of yellowish-brown gummy deposits in vessels and adjacent parenchyma cells—resemble those of the wilt diseases that occur in old trees in forest stands. The fungus is described from pure cultures and its dissemination—possibly by mites—is discussed. The second important disease is that caused by *Rosellinia quercina*, which may endanger seedlings up to 10 years old. Shorter notes are included on *Microsphaera alphitoides*, *Pestalozzia truncata*, and a number of other fungi found on the seedlings, viz. *Discosia artocreas*, *Monochaetia monochaeta*, *Gloeosporium quercinum*, *Botrytis cinerea*, *Alternaria tenuis*, *Cladosporium herbarum*, *Trichoderma lignorum*, *Trichothecium roseum*, *Stysanus stemonites*, *Echinobotryum atrum*, *Dematium pullulans*, *Arthrobotrys* spp., *Fusarium* sp. and *Penicillium* sp. Small-scale preliminary experiments suggest that loosening the soil and watering with a 2% solution of $KMnO_4$ may be a good practical measure against wilts of Oak seedlings, pending further work on more toxic fungicides.

703. KARTAVENKO, N. T. Značenie pritenenija v bor'be s mučnistoj rosoj (*Microsphaera alphitoides* Griff. et Maubl.) duba v lesostepi Zaural'ja. **[The significance of shading in control of Oak mildew (*M. alphitoides*) in the Transurals forest-steppe region.]** *Bot. Ž.* 43 (3), 1958 (399–400). [Russ.]

Acorns of *Quercus robur* were sown on two similar sites in the Chelyabinsk region (*a*) in rows in a nursery, and (*b*) in groups of 5 with a cover first of oats and later of sunflowers. The proportions of seedlings damaged by *M. alphitoides* were 29·2 and 2·4% and the average seedling heights were 7·6 and 9·2 cm. in (*a*) and (*b*) respectively. It is concluded that the shade provided by method (*b*) created less favourable conditions for the growth of *M. alphitoides*, and the cover crops perhaps acted as a barrier to wind-borne spores. The method is recommended to reduce damage to seedling Oak in the region.

443.3. Diseases of Older Stages

Stem, Butt and Root Rots; Root Diseases

See also Nos. 490, 748.

704. **Honey fungus [*Armillaria mellea*].** *Leafl. For. Comm., Lond.* No. 6 (rev.) 1958. pp. 6. Price 6*d*. [Cf. *F.A.* 8 No. 1406.]

705. YDE-ANDERSEN, A. Kærneråd i rødgran forårsaget af honningsvampen (*Armillaria mellea* (Vahl) Quél.). **[Butt rot of Norway Spruce caused by *A. mellea*.]** *Forstl. Forsøgsv. Danm.* 25 (1), 1958 (79–91 + 6 photos). 9 refs. [Dan.e.*e*.]

Increment cores were taken at stump height from 100 trees in each of 27 stands in Nordsjælland and Djursland, and transferred to test-tubes with malt-extract agar slopes for 10 days. The degree of attack in the stump was also classified visually as follows: (0) no attack, (1) faint discoloration, (2) heavy discoloration, (3) rot occupying $< \frac{1}{3}$ of stump diameter, (4) rot occupying $> \frac{1}{3}$ of stump diameter. In younger stands, with stumps in classes (1) and (2) *Fomes annosus* mycelium was absent but there were bacteria on the agar slope and rhizomorphs of *A. mellea* occasionally appeared, whereas with stumps in (3) and (4) *F. annosus* usually appeared on the cores. In older stands (over 40 years) bacteria occurred on some increment cores from all classes, sometimes with rhizomorphs of *A. mellea*, and *F. annosus* was often obtained as pure culture. A closer examination of stumps from which bacteria had been found showed a close correlation between bacteria at stump height and *A. mellea* in the lower part. Colour photographs illustrate the cross and vertical sections of affected stumps of younger trees (20–40 years) and the one-sided root development. The vertical sections show a sharply defined, badly rotted zone in the interior, generally below soil level, with a less heavily decayed zone outside it; outside these a yellowish cone-shaped area extends ca. 50 cm. up the trunk. Bacteria were isolated from this outermost area, *A. mellea* and bacteria from the intermediate zone, and *Torula ligniperda* and bacteria from the innermost zone. Insufficient data are so far available for older trees. This is the first time that *A. mellea* has been shown to cause this type of rot in Denmark, where it has previously been attributed exclusively to *F. annosus*.

706. GARRETT, S. D. **Inoculum potential as a factor limiting lethal action by *Trichoderma viride* Fr. on *Armillaria mellea* (Fr.) Quél.** *Trans. Brit. mycol. Soc.* 41 (2), 1958 (157–64). 13 refs. O.B.D.

As originally reported by D. E. Bliss, fumigation with CS_2 of soil containing roots infected by *Armillaria mellea* results in a notable increase of *Trichoderma viride*, which has a CS_2-tolerance higher than most other soil fungi; the augmented population of *T. viride* invades the fumigated roots, but it is still uncertain how much *A. mellea* mycelium is killed by direct action of the CS_2 and how much by *T. viride*. Other fungi may also be selected by fumigation; *Penicillium wortmanni* is highly resistant to CS_2 and developed prominently on the surface of fumigated wood segments in a previous investigation. The experiment described was designed to determine whether *T. viride*, acting on its own, could kill *A. mellea* in woody inocula, and to what extent its lethal action was governed by its inoculum potential in the soil. Incubation of inoculum segments for 23 days in a pure culture of *T. viride* grown on autoclave-sterilized soil, resulted in a 95% kill of *A. mellea*; dilution of the pure culture to $\frac{1}{4}$ and $\frac{1}{8}$ strengths with unsterilized soil caused a progressive reduction in the lethal effect on *A. mellea*. The greatest lethal activity of *T. viride* against *A. mellea* previously observed in a fumigated and then incubated soil did not exceed that produced by dilution of the pure culture of *T. viride* to $\frac{1}{4}$ strength in this experiment. Experimental incubation of inocula of *A. mellea* in a pure culture of *P. wortmanni* for the same period resulted in no loss of viability, but rather in a slight increase in rate of rhizomorph growth from the inocula thus treated. *From author's summary.*

707. MEREDITH, D. S. **Ecology of fungi colonising coniferous stumps in East Anglia.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (99–100).

A study has been made of seasonal variation in the frequency of stump infection by basidiospores of *Fomes annosus* (increases during drought) and *Peniophora gigantea* (increases during a wet summer). Infection also possibly takes place as a result of spores from the needles being washed down by rain [cf. *F.A.* 18 No. 3004].

708. RISHBETH, J. ***Fomes annosus* in East Anglia.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (98–9).

Tests were made of a number of substances to be applied to stumps immediately after felling, with a view to encouraging growth of fungi able to compete with and suppress *F. annosus*. Among the more promising chemicals tested were polybor-chlorate and NH_4 sulphamate applied as 20 and 40% aqueous solutions respectively.

709. RISHBETH, J. **Detection of viable air-borne spores in air.** *Nature, Lond.* 181 (4622), 1958 (1549). 1 ref.

A simple method for trapping air-borne spores has

recently proved useful for studying dispersal of *Fomes annosus*. Pieces of muslin 20 cm. square are folded and placed in transparent 'self-sealing' envelopes: these are dry-sterilized at 100° C. and stored until required. To collect a sample of air spora, a muslin square is withdrawn from its envelope and attached to a wire frame, previously swabbed with 95% alcohol, by means of a 'Bulldog'-type paper-clip at each corner. The frame is fitted into a suitable holder so that the muslin faces squarely into the wind, supported behind by cross-wires. Static exposures are made in any open situation ca. 2 m. above ground, but exposures may also be made from moving vehicles. The muslin is exposed for periods varying from a few minutes to several hours according to conditions, and is then folded and returned to the envelope, which is re-sealed. The catch is estimated by cutting a 10-cm. square from the centre of the muslin, transferring it to a screw-top bottle and shaking with 20 ml. of sterile water. The suspension and suitable ten-fold dilutions are plated with malt agar to estimate mould spores, and are transferred to sections of freshly cut Pine stem to detect *F. annosus* and also *Peniophora gigantea*, an important competitor of the former on stumps. By this method the two species have been detected at many localities in Great Britain. Of 50 exposures made well outside forest areas, 45 yielded *P. gigantea* and 33 *F. annosus*. In certain circumstances, by making exposures some distance away, it has been possible to demonstrate the presence of *F. annosus* in forests from which it had not previously been reported.

710. BRAUN, H. J. Untersuchungen über den Wurzelschwamm *Fomes annosus* (Fr.) Cooke. **[Investigations on *F. annosus*.]** *Forstwiss. Cbl.* 77 (3/4), 1958 (65–88). 73 refs. [G.g.]

Reports the results of attempting to raise cultures of *Fomes annosus* in (*a*) sterilized and (*b*) unsterilized soils in laboratory conditions, and (*c*) unsterilized soil in the open. From these experiments, and those of other research workers, it is concluded that *F. annosus* cannot grow freely in the soil and is a genuine parasite, thriving primarily in living trees, and secondarily as a saprophyte in the roots of dead trees. Infected host plants and saprophytic stages of the fungus in dead parts of the host are the only sources of infection, and the fungus can spread only by mycelial transference (root contact) or by spores. The influence on the fungus of factors such as site characteristics and host condition are discussed, and the possibilities of control [cf. *F.A.* 13 No. 3095] outlined.

711. TRESCHOW, C. Forsøg med rødgranracers resistens overfor angreb af *Fomes annosus* (Fr.) Cke. **[Studies on the resistance of races of Norway Spruce to attack by *F. annosus*.]** *Forstl. Forsøgsv. Danm.* 25 (1), 1958 (1–23). [Dan.dan.e.]

Experiments in 1937–40, now reported on, showed no differences between provenances from Finland, Norway, Russia and various parts of Germany and of Denmark in their resistance to inoculation and to the spread of the attack.

712. TRESCHOW, C. Forsøg over jordbehandlingens indflydelse på rødgranbevoksningers resistens overfor angreb af *Fomes annosus*. **[Studies on the effect of site treatment on the resistance of Norway Spruce plantations to attack by *F. annosus*.]** *Forstl. Forsøgsv. Danm.* 25 (1), 1958 (25–34). [Dan.dan.e.]

In studies made in 1937 and now reported on, no difference was found in resistance to inoculation with *F. annosus* between trees planted 40–60 years earlier on deep-ploughed or subsoiled sites or in holes without site preparation.

713. ORŁOŚ, H., and BRENNEJZEN, B. Badania nad zwalczaniem hub drzewnych za pomocą zastrzykow środków grzybobójczych. **[Investigations into methods of controlling decay by injecting fungicides into standing trees.]** *Roczn. Nauk leśn.* No. 19, 1957 (3–42). 40 refs. [Pol.russ.e.]

In the method described, a fungicide ($ZnCl_2$, NaF and $CuSO_4$ proved most effective of those tested) was injected into the standing tree via a Pressler borer with a rubber hose attachment; the hole was then plugged with a wooden stopper and the area smeared with a paste. This method was used to treat 48 Pine trees attacked by *Trametes* [*Fomes*] *pini* and 20 by *Fomes annosus*, and 20 Aspens attacked by *F. igniarius*. Other methods, in which the fruiting bodies were cut off and the wound smeared with a fungicidal paste, or the fruiting bodies left in position and their lower surface pained with oil, were applied to *T. pini* on Pine and *F. igniarius* on Aspen. The injection method proved the most satisfactory, killing the mycelium without damaging the tree; painting the surface of the fruiting body was ineffective, and the other method was intermediate. The injection method, however, was not effective in controlling *F. annosus*. *From authors' summary.*

714. KARTAVENKO, N. T. Listvennično gubka (*Fomitopsis officinalis* [Vill.] Bond. et Sing.) v ostrovnyh borah lesostepi Zaural'ja. **[*Fomes officinalis* in the outlying 'islands' of Pine forest in the Trans-uralian forest steppe.]** *Bot. Ž.* 43 (4), 1958 (583–4). 6 refs. [Russ.]

F. officinalis occurs on *Larix sibirica* in these forests, usually forming sporophores on wounds in the lower stem, 2–2·5 m. from the root collar; the rot is also concentrated in this part of the stem. The sporophores scarcely differ from those found on other species in other regions.

715. ETHERIDGE, D. E. **Decay losses in subalpine Spruce [*Picea glauca*, *P. mariana*, and *P. engelmannii*] on the Rocky Mountain Forest Reserve in Alberta.** *For. Chron.* 34 (2), 1958 (116–31). 8 refs.

[Cf. *F.A.* 18 No. 1795.] Subalpine Spruce on the Rocky Mountain Forest Reserve in Alberta was found to have decay amounting to 20% of the gross merchantable volume, with variations among the different sample areas ranging from 1·4 to 41·9%. A large part of this variation is attributed to the influence of site, since it was possible to distinguish two types of site which differed in the nature of the ground vegetation, the growth rate of the trees, and

in the incidence and amount of decay. The average gross volume for survival trees on sites that were described as moist on the basis of distinctive ground-cover associations, was 174 bd. ft. compared with 87 on the dry sites. The average % of cull for trees in each of the two site classes was 24·5 and 9·2 respectively. In trees with a d.b.h. of 8 in., 4·2% of the gross merchantable volume was cull, increasing to 24·7% in trees of 21 in. The % of cull was higher in the faster-growing trees of the understorey (16·4). In cubic feet, the % of decay was 7·8 and 5·4 respectively for the two classes of trees. *From author's summary.*

716. BASHAM, J. T. **Studies in forest pathology. XVII. The pathological deterioration of fire-killed Pine in the Mississagi region of Ontario.** *Publ. Dep. Agric. Can.* No. 1022, 1958. pp. 38. 17 refs.

The present paper is based on studies made on permanent sample plots established in an area devastated by fire in May 1948, on which salvage logging took place from Nov. 1948 till 1952. Detailed results are given for the progress of stain, sap rot, heart rot, total cull; relation between d.b.h. and sap rot and stain, and between severity of burn and depth of penetration of deterioration; volumes of heart rot and other forms of deterioration at different intervals after the fire, reduction of merchantable volume in % of total volume and per acre; all separately for *Pinus banksiana*, *P. resinosa*, and *P. strobus*. The various fungi isolated, and the proportions of loss due to them, are also given. An unexpected finding was the striking difference in the rate of increase in volume of heart rot in fire-killed Pine compared with that in living trees in the 5 years following the fire; in all 3 species the increase was very much greater than would have been expected in comparable living trees. This form of deterioration appears to be due almost entirely to *Fomes pini*.

717. FOSTER, R. E., BROWNE, J. E., and FOSTER, A. T. **Studies in forest pathology. XIX. Decay of Western Hemlock and Amabilis Fir in the Kitimat Region of British Columbia.** *Publ. Dep. Agric. Can.* No. 1029, 1958. pp. 37. 24 refs.

Detailed results are given in tables and graphs of a study made in 4 sample areas of mature mixed *Tsuga heterophylla* and *Abies amabilis*. It was found that *Echinodontium tinctorium* was responsible for > 60% of total decay in *A. amabilis* but only 20% of that in *T. heterophylla*. *Fomes pini* caused 13% of decay in *A. amabilis* and 48% in *T. heterophylla*. In both species < 10% of total infections was due to root rots, which supports previous evidence of their infrequent occurrence in mature stands.

718. THOMAS, G. P., and JOHNSON, A. L. **Decay in young Western Larch in British Columbia.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 14 (2), 1958 (3–4).

A study was made on ½ acre of mixed *Larix occidentalis*, *Pseudotsuga taxifolia* and *Pinus contorta* in which 143 Larch were felled and sectioned. It was found that 12% of trees < 55 years old were infected with wood-rotting fungi, and 58% of those > 70 years. The species most commonly isolated were *Fomes pini*, *Corticium galactinum*, *F. pinicola*, *Coniophora puteana* and *Stereum sanguinolentum*.

719. RISLEY, J. H., and SILVERBORG, S. B. ***Stereum sanguinolentum* on living Norway Spruce following pruning.** *Phytopathology* 48 (6), 1958 (337–8).

In 1956 *S. sanguinolentum* was found causing extensive heart rot of *Picea abies*, associated with pruning wounds, in a plantation at Alder Creek, N.Y. Pruning had been done carelessly, either leaving ragged stubs several inches long, or so close to the main stem as to expose its sapwood. Six affected trees were felled and the extent of decay measured. The total vertical decay originating from the pruning wounds ranged from 6·5 to 11·0 ft., annual spread being at the rate of 1·3–2·2 ft. Although *S. sanguinolentum* has been reported to cause serious decay both in living trees and in stored pulpwood in Scandinavia, this is believed to be the first report of it in America associated with serious heart rot of living Norway Spruce following pruning.

720. BAXTER, D. V., and HESTERBERG, G. A. **Fungi associated with decay in Sugar Maple following logging injury.** *Tech. Note Lake St. For. Exp. Sta.* No. 528, 1958. pp. 2. 2 refs.

Examination in N. Michigan of 252 trees with 10- and 20-year-old logging scars showed that fungi causing most decay were: *Daedalea unicolor*, *Corticium vellereum*, *Tricholoma unifactum*, *Polyporus versicolor* and *Ustulina vulgaris*. Other fungi commonly causing decay in undisturbed stands were not isolated.

721. JACQUIOT, C. Responsable de la coloration du chêne dite 'queue de vache': La fistuline hépatique. [***Fistulina hepatica*: responsible for discoloration of Oak.**] *Rev. Bois Appl.* 13 (7/8), 1958 (19–20). [F.]

Describes the fungus and its biology and its effect on the wood properties, quoting English work on the discoloration ('brown Oak'). Also discusses protection of standing trees, and prevention of fungus spread in felled trees.

722. TRIONE, E. J. **The physiology and pathology of *Phytophthora lateralis* on native *Chamaecyparis lawsoniana*.** *Abstr. of thesis*, in *Dissert. Abstr.* 18 (5), 1958 (1590–1). O.R.S. [Cf. *F.A.* 18 Nos. 1803, 4236.]

723. ZAK, B., and CAMPBELL, W. A. **Susceptibility of Southern Pines and other species to the littleleaf pathogen in liquid culture.** *For. Sci.* 4 (2), 1958 (156–61). 5 refs.

[Cf. *F.A.* 17 No. 1822; 13 No. 3191.] After exposure for 4–7 days to the zoospores of *Phytophthora cinnamomi* in a liquid medium, the tips and distal sections of the roots of 1-year seedlings of *P. echinata* (385 pieces) and *P. taeda* (457) showed 58 and 39% infection respectively. In a similar study of the root tips (64–87 each) with 2- to 4-month seedlings the following %s were infected after 76 hours to exposure: *P. echinata* 92, *P. taeda* 58, *P. palustris* 64, *P. elliottii* var. *elliottii* 54, *Cupressus*

arizonica 23, *Cercis canadensis* 7, *Liquidambar styraciflua* 0.

724. BANERJEE, S. **On the biology of *Auricularia auricula-judae* (Linn.) Schroet. causing rot in Elder (*Sambucus nigra* L.).** *Proceedings of the National Institute of Sciences of India, New Delhi* 22 (6), 1956 (1957), (316–34 + 31 photos). 39 refs. O.R.S.

Describes the fungus, the progress of decay in infected trees in Scotland, laboratory culture tests and tests of decay resistance, and inoculation experiments in the laboratory and in the field.

Wilts, Diebacks etc.

See also Nos. 204, 696, 827.

725. HAFSTAD, G. E. **Possible long distance spread of Dutch Elm disease by transported beetles.** *Plant Dis. Reptr.* 42 (7), 1958 (893–4). A.P.B.

The occurrence of first cases of the disease near centres of transport in Illinois suggests that it may be spread inadvertently by man.

726. DIMOND, A. E., and HUSAIN, A. **Role of extracellular enzymes in pathogenesis of Dutch Elm disease.** *Abstr.* in *Science* 127 (3305), 1958 (1059). O.R.S.

The main function of cellulase and polygalacturonase produced extracellularly by the Dutch Elm disease pathogen is probably to digest cell-wall materials, thus aiding the fungus in obtaining its food supply. The cellulase does not attack cellulose from Elm wood, cotton or filter paper, but rapidly hydrolyses carboxymethylcellulose to glucose. The pectic enzyme hydrolyses Na polypectate to galacturonic acid. Neither enzyme produces signs of water shortage when introduced into Elm cuttings. [Cf. *F.A.* 18 No. 1804.]

727. BOYER, M. G. **Phytotoxic action of *Endoconidiophora fagacearum* Bretz.** *Abstr. of thesis*, in *Dissert. Abstr.* 18 (6), 1958 (1954). O.R.S.

When culture filtrates, spore suspensions of *Endoconidiophora fagacearum*, and substances isolated from vessels and sapwood, were injected into vessels of Red Oak, they did not measurably alter the rate of tylose formation. In a chromatographic examination of sap constituents of healthy Red Oak, glucose, sucrose and xylose were observed in addition to 14 amino acids and 2 forms of inorganic phosphate. From diseased vessels a fluorescent substance was isolated. Its chromatographic properties corresponded to aesculin. In addition, tannic acid and an unknown flavonoid compound were observed. Rate of formation, distribution and types of leaf symptom were observed on diseased Red Oaks. This, in conjunction with chemical evidence, indicated that chlorotic and necrotic leaf symptoms were due to a deficiency of mineral and organic constituents. Culture filtrates of the pathogen induced wilting but no necrosis of Red Oak leaves. The wilting component appeared to be a polysaccharide containing glucose as the only reducing sugar. Growth stimulatory substances were also present. Chromatographic analysis of the filtrates revealed several amino acids. Of these, methionine is known to be a growth stimulator.

728. JONES, T. W. **Mortality in wilt infected Oaks.** *Plant Dis. Reptr.* 42 (4), 1958 (552–3). A.P.B.

In 365 infected Red Oaks and 97 infected White Oaks examined, the mortality rate was lower in the White Oak group than the Red.

729. YOUNT, W. L. **Results of root inoculations with Oak wilt fungus in Pennsylvania.** *Plant Dis. Reptr.* 42 (4), 1958 (548–51). 5 refs. A.P.B.

Red Oak trees in 4 series, 1954–55–56–57, were inoculated with *Chalara quercina* in the roots at varying distances from the stems. Stem-inoculated trees served as checks. The length of time between inoculation and the first foliage symptoms was longer for the root-inoculated trees in every series. Incubation periods for both stem- and root-inoculated trees varied extensively from season to season. A majority of the infections in root-inoculated trees in each series developed symptoms at a common date. One or two infected trees from root inoculation in each series did not develop symptoms for a year or more. The distance of the point of inoculation from the stem was not a significant factor. *From author's summary.*

730. HIMELICK, E. B., and CURL, E. A. **Transmission of *Ceratocystis fagacearum* by insects and mites.** *Plant Dis. Reptr.* 42 (4), 1958 (538–45). 18 refs. A.P.B.

Experiments conducted under natural forest conditions support the theory that certain sap-feeding insects are vectors of the Oak wilt fungus. In baited traps 369 insects were caught over wounds on 92 of 235 Oaks located near the source of Oak wilt inoculum. Three of the 92 trees became infected and wilted. Species of the Nitidulidae were found in each of the traps on the infected trees. In one greenhouse experiment *Chrysobothris femorata* transmitted the fungus through feeding wounds which it inflicted upon 13 of 54 Oak seedlings. In another, *Garmania bulbicola*, a mite, transmitted the fungus to mechanically made wounds on 11 out of 32 Oak seedlings. *From authors' summary.*

731. BUCHANAN, W. D. **The small Oak bark-beetle transmits the Oak wilt disease.** *J. For.* 56 (6), 1958 (414–5). 2 refs.

In continuation of previous work [cf. *F.A.* 18 No. 3026; 19 No. 4423], tests using 3 sources of inoculum were made on 241 seedlings of *Quercus rubra*, *Q. palustris*, and *Q. velutina*. Results indicate that *Pseudopityophthorus minutissimus* may help in spreading the disease, but that the % of beetles transmitting it is very small.

732. KOBAYASHI, T., and ITO, K. ***Phomopsis* and its perfect stage *Diaporthe* causing a die-back of the *Paulownia* tree.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 103, 1957 (57–67 + 1 plate). 15 refs. [Jap.jap.E.e.]

Covers the morphology of the conidial stage (*P. imperialis*) and of the ascigerous stage (*D. eres*), their genetic relation, laboratory culture and taxonomy. When associated with the dieback fungus *Physalospora paulowniae* [cf. *F.A.* 13 No. 3113], it is shown by inoculation trials to be only slightly pathogenic.

733. GREMMEN, J. Een afsterven van *Pinus*-soorten in Nederland en de vermoedelijke oorzaak. **[A die-back of Pines in the Netherlands and its probable cause.]** *Ned. Bosb. Tijdschr.* 30 (7), 1958 (199–208). 12 refs. [Du.e.]

Describes the symptoms of the disorder, which has seriously affected *P. nigra* var. *austriaca*, and to a lesser degree *P. sylvestris* and *P. mugo* var. *rostrata* and occasionally *P. nigra* var. *calabrica*, in stands 20–50 years old, in N. Veluwe and Friesland. *Rhizina undulata* has been found in all stands where this dieback occurs, and always in association with burnt areas (arising from forest or heath fires, etc.), probably as the result of reduced competition from other soil organisms. Research on the fungus continues, and European and American literature on it is discussed. Isolating burnt and infected areas by trenching is suggested for control. [Cf. *F.A.* 17 Nos. 3084–5.]

Cankers, Stem Rusts etc.

See also No. 494.

734. RIDÉ, M. Sur l'étiologie du chancre suintant du peuplier. **[The etiology of the bleeding canker of Poplar.]** *C.R. Acad. Sci., Paris* 246 (19), 1958 (2795–8). 6 refs. [F.] O.R.S.

Cultures of *Aplanobacterium populi* sp. nov., isolated from cankers of *Populus* × *euramericana* and *P. tremula*, produced the characteristic cankers when inoculated into the trees at intervals over 2 years. Its characteristics in culture are described.

735. ANDERSON, G. W. **Hypoxylon infection not greatly influenced by sex of Aspen trees.** *Tech. Note Lake St. For. Exp. Sta.* No. 535, 1958. pp. 1.

A survey of 495 Aspens in N. Minnesota showed *Hypoxylon* canker to occur on both ♂ and ♀ trees, with a slightly higher level of infection for ♀ trees.

736. GRANDI, C. Il cancro del castagno ed il risanamento della zona pedemontana nel Cantone Ticino. **[Chestnut blight and the rehabilitation of the foothills region of the Ticino.]** *Schweiz. Z. Forstw.* 109 (7), 1958 (375–91 + 2 plates). [It.g.]

737. MOSS, V. D. **Acti-dione stove oil treatment of blister rust trunk cankers on reproduction and pole Western White Pine.** *Plant Dis. Reptr.* 42 (5), 1958 (703–6). 3 refs. A.P.B.

Mycelia of *Cronartium ribicola* around wounds of partially excised stem cankers on young regeneration and pole-size *Pinus monticola* were killed by 150 p.p.m. (weight) Acti-dione (cycloheximide) in No. 1 stove (fuel) oil. Stem cankers were removed, using a hatchet or knife, by starting the cut 1 in. (young regeneration) or 2 in. (pole-size) above the outer limit of surface discoloration and extending the cut downwards along the visible canker margin to the proximal limit of the surface distribution. Treatment was completed by spraying the cut surfaces to run-off with Acti-dione stove oil. No. 1 stove oil proved particularly suitable as a carrier for Acti-dione. *From author's summary.*

738. WAGENER, W. W. **Infection tests with two rusts of Jeffrey Pine.** *Plant Dis. Reptr.* 42 (7), 1958 (888–92). 9 refs. A.P.B.

In an attempt to find alternate hosts for *Peridermium stalactiforme* and another species of *Peridermium* found on *P. jeffreyi* in Inyo County, Sierra Nevada, it was found that positive infections could be obtained from aeciospores of *P. stalactiforme* whether from Jeffrey or Lodgepole Pine, whereas all trials with the Inyo *Peridermium* were negative. Differences between the two species of rust are listed.

739. RIQUÉ, T. Análisis químico de los nudos de coihue. **[Chemical analysis of tumours on *Nothofagus dombeyi*.]** *Rev. Invest. for., B. Aires* 1 (3), 1957 (3–6 + 1 plate). 3 refs. [Span.]

Woody tumours formed on *Nothofagus dombeyi* by the action of the fungus *Cyttaria darwini* were found to show a marked decrease in cellulose content, with a parallel increase in water-soluble substances, especially reducing substances. The % of substances soluble in NaOH solution was also increased, with a parallel increase of lignin.

Foliage Diseases

740. BATKO, S., MURRAY, J. S., and PEACE, T. R. ***Sclerophoma pithyophila* associated with needle-cast of Pines and its connexion with *Pullularia pullulans*.** *Trans. Brit. mycol. Soc.* 41 (1), 1958 (126–8 + 1 plate). 11 refs. O.B.D.

Severe defoliation of Scots Pine by the gall midge *Cecidomyia baeri* associated with the fungus *Sclerophoma pithyophila* is described. Culture work supported Robak's view that a form of *Pullularia pullulans* is a stage of *Sclerophoma*. *Phoma acicola*, quoted by several authorities as synonymous with *S. pithyophila*, occurs under different pathological circumstances from *Sclerophoma* and is probably less important. *Authors' summary.*

741. RACK, K. Leistungen gebräuchlicher Geräte zur Bekämpfung der Kiefernschütte. **[Performance of equipment for use in controlling Pine needle-cast.]** *Forstarchiv* 29 (6), 1958 (145–8). 2 refs. [G.]

Types of equipment for spraying and fogging are reviewed, including hand sprayers, knapsack power-sprayers, lorries with spraying devices, a helicopter and an aeroplane. As an aid in calculating comparative costs, a table has been compiled, based on data from firms, publications, and actual experience, showing for each type, the capacity, range of action, number of fillings required per ha., filling time, pressure, speed of working, and duration of effect, as well as any additional costs. A formula is given for calculating costs of aerial control.

742. MORIONDO, F. Alcuni aspetti della epidemiologia della *Melampsora pinitorqua* Rostr. sulle alpi marittime. **[The epidemiology of *M. pinitorqua* in the Maritime Alps.]** *Ital. for. mont.* 13 (3), 1958 (128–33). 5 refs. [It.]

Compares the behaviour of the disease here with that at Feniglia [cf. *F.A.* 18 No. 3037], and attributes the differences partly to climate and partly to the difference in the alternate host—*Populus tremula* in the first case and the more susceptible *P. canescens*

in the second. The disease has been favoured in the Maritime Alps by large-scale clear felling of Pine during the war, resulting in large areas of young Pine regeneration and Poplar suckers. The apparently greater susceptibility of *Pinus sylvestris* compared with *P. pinea* and *P. pinaster* is probably due to its regenerating on the moister sites that are also favoured by Poplar.

743. SCHWENKE, H. J. Beiträge zur Biologie und zum Parasitismus von *Septotis populiperda* Watermann et Cash. **[On the biology and parasitic action of *S. populiperda*.]** *Abstr. of thesis*, in *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 3, 1958 (102–6). [G.]

Describes experiments in culture and on Poplars in the field showing high moisture requirements for germination, infection and growth. At relative humidity < 90%, spread in the host ceased. Conidia were formed on dead tissue only under the influence of direct sunlight. Artificial bark infection with this leaf fungus succeeded best at flushing time, when it led to the death of the affected shoot. No infection was possible in summer. The appearance of the diseased bark varied considerably between seasons. On some occasions, infection penetrated from a petiole to the bark. The potential and actual importance of the fungus, and the question of its identity with *Septogloeum populiperdum* is discussed.

744. CREELMAN, D. W. **The control of spot anthracnose of Linden.** *Plant Dis. Reptr.* 42 (7), 1958 (895–6). 2 refs. A.P.B.

Spot anthracnose of *Tilia* spp. caused by *Elsinoë tiliae* was controlled in Nova Scotia by two sprays of captan applied early in the summer. Bordeaux mixture 10–5–100 was also effective on *E. tiliae*, but ineffective against *Cercospora microsora*. *From author's summary.*

444. Virus Diseases

See No. 693.

45. Damage by Animals

451. Mammals

See also Nos. 90–1, 445–8.

745. HEYDEBRAND, E. O. Über Biologie und Ethologie des Siebenschläfers (*Glis glis* L.). **[The biology and habits of *G. glis*.]** *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 3, 1958 (73–7). 7 refs. [G.]

Reports observations in the field and in captivity. Bark feeding was observed on Birch, Aspen, and Beech, but girdling was not. In captivity, though not in the free state, the animals bit off short shoots of Larch.

746. TURČEK, F. J. Konzumcia lesných semien myšou žltohrdlou (*Apodemus flavicollis*) a možnosti ochrany semien a semenáčkov. **[The consumption of tree seeds by *Apodemus flavicollis* and the protection of seeds and seedlings.]** *Práce výzkum. Úst. lesn. ČSR* No. 12, 1957 (251–303). 86 refs. [Cz.russ.e.]

Results are tabulated of laboratory tests made with 7 wild mice in 10-day periods, on the consumption of seeds of 11 species of the main tree species. Food-preference tests were also made under statistical control with 5 mice with seeds of 15 species. Spruce and Beech were significantly preferred, and at the other end of the scale, Silver Fir, Common Juniper and *Ailanthus* sp. were significantly rejected and rarely touched. All seeds were peeled and only the endosperms consumed. Field and laboratory tests also showed that more seeds were gnawed than consumed, but not all the injured seeds were lost for forest regeneration. Both mechanical and chemical control methods were tested. Spring traps proved ineffective and time-consuming, seed treatment ineffective, laborious and expensive. The use of 'bait stations' is recommended. These consist of a polythene bait container ca. 5 cm. in diameter, 20–25 cm. long, open at one end only and filled with 1 kg. of acorns or Beech nuts mixed with 50 g. Zn_3P_2. They are placed in a grid pattern about 20 m. apart and at least 16 per ha., in suitable positions (especially under dense vegetation), and left for some months before replenishing. They are effective throughout the year. One poisoned acorn suffices to kill a mouse in ca. 2 hours. This method of permanent control is said to be economical, and to protect not merely seeds, but also seedlings and young trees. [Cf. *F.A.* 16 No. 4272.]

747. WOOD, R. F., and HOLMES, G. D. **Protection of planted trees.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (43).

A wide variety of chemical repellents are under test for protection of newly planted hardwoods against damage by roe or red deer. A trial of repellents applied to Poplar stems at Rogate Forest in 1956 indicated that bone oil and a proprietary compound, Arbinol, gave a high degree of protection for a full season.

748. VANĚK, J. Orientační studie následků loupání lesních porostů zvěří. **[Studies of the results of injury to the bark of trees by animals.]** *Sborn. čsl. Akad. zeměd. (Lesn.)* 3 (1), 1957 (59–78). 6 refs. [Cz.cz.russ.g.]

Studies were made of 127 injured and 39 uninjured trees [no species given] in 3 mountain and one high plateau site. Injured trees suffered 51% more decay than uninjured. Danger of decay increased with age and size of wound. Red deer inflicted more damage than fallow deer or sheep. Increment decreased as a result of injury; in injured trees > 40 years old, growth rings are on average 14% narrower than those of uninjured trees of the same age. The reduction in growth is greater in trees where the injury extends more than halfway round the stem. *From author's summary.*

452. Birds

See Nos. 88, 447–8.

453. Insects

See also Nos. 281, 315, 486–7, 701.

749. Relazione illustrativa sulla lotta contro i parassiti delle piante forestali nell'esercizio 1956–57. **[Account of operations against forest pests [in Italy], 1956–57.]** *Bollettino Ufficiale del Corpo Forestale dello Stato, Roma* 1958 (5), (324–37). [It.]

Lists areas treated, control methods and degree of success, against *Thaumetopoea pityocampa, T. processionea, Rhyacionia buoliana, Lymantria dispar, Dioryctria splendidella, Myelophilus piniperda, Sap-erda carcharias* and some others.

750. KANGAS, E., and KANERVO, E. Über die jüngsten Untersuchungen auf dem Gebiete der forst- und landwirtschaftlichen Zoologie in Finnland. **[The most recent studies on forestry and agricultural zoology in Finland.]** *Z.PflKrankh.* 65 (7), 1958 (411–6). 25 refs. [G.e.] E.M.B.

Summarizes some recent research, including that on barkbeetles, cone injuries, and the part played by ants in establishment of trees on rocks in S. Finland.

751. MORRIS, R. F. **A review of the important insects affecting the Spruce-Fir forests in the Maritime Provinces [Canada].** *For. Chron.* 34 (2), 1958 (159–89). 75 refs.

Reviews the literature on *Choristoneura fumiferana, Adelges piceae, Dendroctonus piceaperda, Diprion hercyniae, Acleris* [*Peronea*] *variana*, and *Lambdina* [*Ellopia*] *fiscellaria.*

752. MCCAMBRIDGE, W. F., NAGEL, W. P., and KOWAL, R. J. **Forest insect conditions in the Southeast during 1957.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 93, 1958. pp. 10.

Pests covered include: *Dendroctonus frontalis*, with notes on mortality through the extreme cold of Dec. 1957, *D. terebrans, Ips* spp., *Dioryctria* spp., *Rhyacionia* spp., weevils, sawflies, etc. *Adelges piceae* was detected on *Abies fraseri* on Mt. Mitchell. Damage by a Pine leaf-chafer, *Pachystethus oblivia*, in a young plantation in N. Carolina is described.

753. LANDGRAF, A. E., and OSTMARK, H. E. **Forest insect conditions in the Centra Rocky Mountains—1957.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 34, 1958. pp. 20.

Presents data from ground and aerial surveys of damage by 9 insect pests. [Cf. *F.A.* 19 No. 2001.]

754. ŽIVOJINOVIĆ, S. Najznačajniji štetni insekti mekih lišćara u toku 1956 godine. **[The most important insect pests of Poplar and Willow in 1956.]** *Topola, Beograd* 1 (2), 1957 (81–92). 4 refs. [Serb. serb.f.]

Lists 14 species of insect pests occurring in dense populations in Serbia in 1956 and causing damage to Poplar and Willow plantations. Species belong mainly to the Coleoptera and Lepidoptera, with one each from the Homoptera, Hymenoptera and Acari. Some notes are given on the extent of the damage, and the biology of the insects.

755. PATOČKA, J. Anwendung der Photoeklektore im Forstschutz. **[Use of the 'light selector' in forest pest control.]** *Anz. Schädlingsk.* 31 (6), 1958 (81–3). 7 refs. [G.]

The device, used at the Czech forest experiment station at Banská Štiavnica for sampling insect populations in winter, consists of a darkened glass cylinder, or a wooden box, with a small triangular opening at one end, to which a small triangle of cardboard is attached horizontally. When twigs from test trees are inserted in the cylinder and the whole thing stored in a warm room with the aperture towards the light, larvae will move towards the opening and emerge on to the triangular platform, whence they fall into a dish of water or ethylene glycol placed under the opening. Critical counts are given for certain species, e.g. for *Choristoneura murinana* ca. 30–50 larvae/m. of twig and for *Zeiraphera rufimitrana* ca. 90–150 larvae/m. of twig.

Insects: Natural and Biological Control

See also Nos. 767, 772, 779, 784, 788–9, 792, 797, 806–8, 818–21.

756. KOZŁOWSKA, C. Grzyby owadobójcze występujące na materiale pochodzącym z poszukiwań szkodników leśnych. **[Insect-attacking fungi occurring on material collected for the detection of biological forest injuries.]** *Roczn. Nauk. leśn.* No. 19, 1957 (43–61). 39 refs. [Pol.russ.e.]

Gives a tabulated list of 16 species of fungi collected from forest insects over a 4-year period in Poland, showing their hosts and the frequency of their occurrence. Concludes that *Beauveria bassiana* and *B. globulifera* are the most suitable, because of their abundance and wide range of hosts, for experiments in biological control. *From author's summary.*

757. GÖSSWALD, K. Über die Förderung der Waldhygiene durch Vermehrung der roten Waldameise. **[Promoting the health of the forest through propagation of *Formica rufa*.]** *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 3, 1958 (129–45). 89 refs. [G.g.]

A summary of the problem, based mainly on literature [largely the author's previous publications], discussing importance, taxonomy, propagation, protection, previous and projected research, and practical results in parious parts of Germany.

758. HABER, A. Badania na rolą płazów w biocenozach lasów objętych gradacją szkodliwych owadów i akcjami chemicznymi w latach 1948–1949. **[Investigations into the role of amphibia in forest biocoenoses infested by insects and subjected to chemical treatment in 1948–49.]** *Roczn. Nauk leśn.* No. 20, 1957. pp. 91. ` 21 refs. [Pol.russ.e.]

Trapping on plots in the Łobodno forests, which were suffering heavy attack by *Acantholyda nemoralis* and in some places by *Lymantria monacha*, showed that 6 species of amphibia were present, *Bufo bufo* and *Rana temporaria* being the most frequent (52·5 and 42·1% respectively). A study of the contents of the alimentary tract of these two species showed that *R. temporaria* was the more efficient in controlling pests, but it is probable that the normal balance had been upset by the spraying. It is concluded from

the results that amphibia are less important in the control of insect pests than birds or insectivorous mammals, although they may be important when present in large numbers. Results are shown in graphs and tables. *From author's summary.*

Insects: Chemical Control (General)

See also Nos. 636–8, 764, 767–8, 773–4, 778, 780–2, 785, 790, 793–5, 798, 802, 818–20, 822, 824–5.

759. SIDDIQI, A. A. **Effect of environmental factors on the toxicity of organic insecticides—a review.** *Pakistan J. For.* 7 (4), 1957 (370–5). 28 refs.

Covers the effects of temperature, humidity, sunlight, wind, and rain.

760. GIESE, R. L., BENJAMIN, D. M., and CASIDA, J. E. **Results of trunk implantation of systemic insecticides in conifers.** *J. econ. Ent.* 51 (3), 1958 (400–1). 6 refs.

[Cf. *F.A.* 18 No. 3076.] Technical grades of 90% purity of Demeton, Thimet and Chipman R-6199, of 50% Dimefox and of 95% Am. Cyanamid 12880 (*o, o*-dimethyl S-methylcarbamoylmethyl phosphorodithioate) were each introduced into several *Abies balsamea* trees, 4 in. in diam., via 4 holes bored 6–12 in. above ground. Doses were 4 and 1 g./tree on 2 July except the last (3 Sept.). Kills of the Balsam gall midge (*Itonida balsamicola*) were counted separately for the top, middle and lowest level of the crowns. Demeton gave the most rapid kill and at the lower dose (100% in 3 days). Two eulophid parasites (named) continued their development on larvae killed by 12880 which, however, was applied too late in the season. Dimefox gave a complete kill at the higher dose, but both doses were phytotoxic. Demeton tested (15 Aug.) on transplanted colonies of *Neodiprion lecontei* on 10-year *Pinus resinosa* at dosages of 4, 2 and 0·5 g./tree gave complete kills.

Thysanoptera

761. CAPECKI, Z. Obumieranie modrzewia na Śląsku Cieszyńskim. [**Larch dieback in the territory of Teschen Silesia.**] *Sylwan* 101 (8), 1957 (1–28). 19 refs. [Pol.russ.e.]

Describes the nature of the injury caused by *Taeniothrips laricivorus* and the spread of the insect in Europe and especially in Poland, where it was first observed in 1947 and caused heavy damage in 1949, 1952 and 1954, to Larch growing in mixture with Spruce. The age range for damage appeared to be 10–30 years with ca. 87·5% occurring between 10 and 25 years. Infested trees occurred at altitudes of 450–980 m., with 80% at 500–700 m. and only 7% below 500 m. Most of the damage (58%) was on S., S.W. and S.E. slopes, especially at the higher altitudes. Single trees were most affected, resistance increasing with the size of a group of trees. Attack by *T. laricivorus* appeared to reduce resistance to frost and to canker. *From author's summary.*

Hemiptera

See also Nos. 82–5, 785.

762. PETERSEN, B. B., and SØEGAARD, B. **Studies on resistance to attacks of *Chermes cooleyi* (Gill.) on *Pseudotsuga taxifolia* (Poir.) Britt.** *Forstl. Forsøgsv. Danm.* 25 (1), 1958 (35–45). 5 refs. [E.e.dan.]

In greenhouse experiments in which 140 two-year-old plants of 23 clones were exposed to attack, susceptibility to attack, as measured by the number of wax deposits, was fairly constant within clones, but varied widely between them. Only one clone remained free from attack during the 3 years of the experiment.

763. SPEERS, C. F. **The Balsam woolly aphid in the southeast [of the U.S.A.]** *J. For.* 56 (7), 1958 (515–6). 1 ref.

Records the discovery of an infestation of Fraser Fir by *Adelges piceae* on Mt. Mitchell, N.C., mentioning also *A. nüsslini* on the same species near Luray, Va.

764. SCHELLER, H. D. VON. Massenvermehrung der Sitkafichtenlaus, *Elatobium* (=*Liosomaphis*) *abietina* Walk. in Nordwestdeutschland. [**Outbreak of *E. abietina* in N.W. Germany.**] *Anz. Schädlingsk.* 31 (6), 1958 (85–8). 13 refs. [G.]

E. abietina has existed for years in small numbers in Schleswig-Holstein. In 1957, however, favoured by the weather, a definite outbreak occurred on Sitka Spruce. Notes are presented on hosts (a number of *Picea* spp.), damage inflicted, and natural enemies. Dusting with E605, BHC [dosages not given] or Basudin [Diazinon-type] was successful; costs were DM.50–100/ha. Control measures had undesirable side effects, especially on natural enemies, and it is well to ascertain population densities and those of natural enemies before undertaking them. The best time for dusting is early spring. The pest prefers shade and is found in greatest numbers in dense, poorly thinned stands.

765. DAVATCHI, A., and REMAUDIÈRE, G. Quelques Fordinae nouveaux ou peu connus des *Pistacia* (Hom. Aphidoidea). [**Some new or little known Fordinae on *Pistacia*.**] *Rev. Path. vég.* 36 (3), 1957 (165–83). 10 refs. [F.] I.M.I.

Describes, with notes on their biology, habitat, distribution, and systematy, the generations so far collected of *Forda kaussarii* sp. nov., *Slavum esfandiarii* sp. nov., *Geoica utricularia rungsii* subsp. nov., and *G. mimeuri*, gall-inhabiting aphids of *Pistacia khinjuk*, *P. mutica*, *P. atlantica*, and *P. terebinthus*, respectively. The root-inhabiting forms of these species remain unknown.

766. REMAUDIÈRE, G., and TAO, C. CHIA CHU. Les Fordinae (Hom. Aphidoidea) du *Pistacia sinensis*. [**The Fordinae of *P. sinensis*.**] *Rev. Path. vég.* 36 (4), 1957 (223–36). 16 refs. [F.e.] I.M.I.

Describes the successive generations of 3 species of gall-making aphids and clarifies their systematy as *Forda sichangensis* nom. nov., *Chaetogeoica foliodentata* comb. nov., and *Asiphonella dactylonii*.

767. CROSBY, D., and BJORKBOM, J. C. **Timely salvage can reduce losses from Beech scale-Nectria attack.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 82. 1958. pp. 4.

Notes on distribution, damage, biological, chemical and silvicultural control of the Beech scale

(*Cryptomeria fagi*) which, in conjunction with *Nectria* fungus, is causing heavy mortality of Beech in Maine. Experiments in the Bartlett Experimental forest showed that heavy scale infestation was not markedly reduced by opening up the stands and that in lightly infected stands cuts removing ca. ½ the b.a. would be necessary to reduce infestation. A guide is given to salvage fellings in relation to the extent of attack.

Lepidoptera

See also Nos. 86, 349, 644, 758, 826.

768. STEFANOV, D., and KEREMIDČIEV, M. Izsledvanija za ustanovjavane na nai-podhodjašti i evtini metodi za borba s njakoi važni nasekomni vrediteli po gorite. **[Investigation on the most suitable and cheapest methods of controlling some important forest insect pests.]** *Nauč. Trud. lesoteh. Inst., Sofia* No. 5, 1957 (97–156). 21 refs. [Bulg. russ.]

A detailed account of trials to control *Lymantria dispar*, *Malacosoma neustria*, *Tortrix viridana*, *Cacoecia xylosteana*, and *Haltica saliceti* during the 1949-55 outbreaks in Bulgaria. Several different chemical preparations (e.g. BHC and DDT) and methods of application (aerial and ground) were used in different seasons and at different stages of the insects' development. Details are given of the cost and efficiency of control.

769. BETTS, M. M. **Notes on the life-history of *Ernarmonia conicolana* (Heyl.) (Lep., Eucosmidae).** *Ent. mon. Mag.* 94 (1129), 1958 (134–7). 11 refs.

The insect appears to be widespread in S. England in areas with established Pine forest, the larvae living in Pine cones.

770. ANDERS, O. Vorläufige Untersuchungsergebnisse über die Lebensweise des Pappelknospenwicklers *Semasia oppressana* Tr. und des Pappeltriebwicklers *Semasia aceriana* Dup. **[Preliminary investigations into the life history of *S. oppressana* and *S. aceriana*.]** *Anz. Schädlingsk.* 31 (7), 1958 (101–7). 14 refs. [G.]

771. NOBUCHI, A., and INOU(Y)E, M. **[Studies on the larvae of *Spilonota lariciana* Heinemann injurious to Larch.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 8, 1957 (212–7). 3 refs. [Jap.jap.e.*e.*]

The external morphology of the immature larva is described, and some ecological notes are added. This species is one of the most general and troublesome of the moths infesting Larch in Japan.

772. LOUGHEED, T. C., and MACLEOD, D. M. **Extracellular metabolic products of a *Hirsutella* species.** *Nature, Lond.* 182 (4628), 1958 (114–5). 8 refs.

[Cf. *F.A.* 18 No. 1291.] A species of *Hirsutella* parasitic on larvae of *Choristoneura fumiferana*, when grown in liquid cultures, produces a highly viscous metabolite. Investigation showed this to contain a number of polysaccharides, one of which can form a charged complex with borate. This is of interest in view of the fact that polysaccharides produced by some parasitic fungi can cause significant reactions in the host.

773. WEBB, F. E., MACDONALD, D. R., and CAMERON, D. G. **Aerial spraying against Spruce budworm in New Brunswick—1957.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 14 (3), 1958 (1–2).

An account of the choice and extent of the area treated (5·2 million acres), techniques employed, results etc. Assessment of the results of spraying in 1952–57 indicates that the mortality in diameter classes < 6 in. has been the same in sprayed and unsprayed areas, but that spraying has prevented or delayed mortality in the larger classes. This appears to be true for both Fir and Spruce.

774. BLAIS, J. R. **The Spruce budworm situation in the Lower St. Lawrence and Gaspé at the end of 1957 with special reference to spraying operations.** *Pulp Paper Mag. Can.* 59 (6), 1958 (218 . . . 224). 6 refs.

Includes maps of outbreaks during 1949–56 and of areas sprayed (since 1954) once and twice. The main purpose (largely successful) is to prolong the life of the Balsam Fir, but re-spraying on a much greater scale against severe re-infestations is possibly involved. Recurrent epidemics of the last 150 years, characteristic of the boreal forest, have starved themselves out by killing, over thousands of square miles, the mature and over-mature Balsam Fir of the climatic climax. Such stands have increased since 1938 by the release of suppressed and shaded Fir, following the killing of White Spruce by sawfly and barkbeetle and of Birch by dieback. Saving the Fir by spraying possibly helps to perpetuate budworm epidemics that would otherwise die out in a short period with the change in forest composition. Accelerated exploitation of the most susceptible Fir stands, followed by spraying of the budworm still subsisting in the altered forest, might suppress the outbreaks.

775. REEKS, W. A. **The Jack-Pine budworm [*Choristoneura pinus*] on planted Pines in the Spruce Woods Forest Reserve of Manitoba, 1957.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 14 (2), 1958 (2–3).

[Cf. *F.A.* 18 No. 4314.] *Pinus banksiana*, *P. contorta*, and *P. sylvestris* are all attacked. The nearest stands infested by Jack Pine budworm are natural stands of *P. banksiana* ca. 140 miles to the east, and it is unlikely that invading moths could come from so far. Larvae were probably brought into the planting area with cones used for seed extraction. A side effect of the infestation is abundant natural regeneration of *P. sylvestris*, which is usually uncommon in Manitoba and has presumably been encouraged by the opening of the canopy due to defoliation.

776. PRENTICE, R. M., and NAIRN, L. D. **Increment reduction of Scots Pine following two years of defoliation by the Jack Pine budworm [*Choristoneura pinus*].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 14 (2), 1958 (3).

The Scots Pine shows a striking reduction of increment in 1956, the first year of attack, indicating that this species is very sensitive to budworm defoliation.

777. JÜTTNER, O., and SCHWERDTFEGER, F. Zuwachsverlust durch Frass des Eichenwicklers. **[Increment losses through *Tortrix viridana*.]** *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 3, 1958 (126–9). [G.]

Briefly reports investigations on Oak of various ages and flushing types in the Münsterland and near Hamburg. While volume increment in stands or years free from outbreaks corresponded to yield-table values, it was less than half in periods of heavy defoliation. A stand of late-flushing Oak, presumably Slavonian, which was never defoliated, was greatly superior in height, diameter and volume increment to a neighbouring, regularly defoliated stand.

778. NEIRA, M., and TORRENT, J. A. Tratamientos de los encinares españoles. **[Treatment of Spanish evergreen Oak forests.]** [*Docum.*] *6th Sess. FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/69-A*. 1958. pp. 7. [Span.]

These forests consist mainly of *Quercus ilex*, but with some admixture of *Q. suber* and *Q. lusitanica*. The article describes the principal insect pests (*Tortrix viridana, Malacosoma neustria*) with mention of secondary ones, and methods, apparatus, and costs of chemical control (ground and aerial spraying).

779. OSSOWSKI, L. L. J. **On the virus causing polyhedral wilt disease of the Wattle bagworm, *Kotochalia* [*Acanthopsyche*] *junodi* (Heyl.).** *Repr.* from *South African Journal of Science, Johannesburg* 54 (3), 1958 (75–6). 5 refs.

Methods are given for the detection, isolation, and purification of the virus, which is described and classified as belonging to the genus *Borrelina*.

780. OSSOWSKI, L. L. J. **An aerial spraying experiment against Wattle bagworm (*Acanthopsyche junodi*) [I].** *Rep. Wattle Res. Inst. S. Afr. 1953/54*, 1954 (49–53).

Replicated plots were sprayed from the air with 0·75 lb. toxaphene/gal. of diesoline at 3 and 4 gal./acre. Differences in kill from these rates were not significant, but in each case were greater in the tops than in the lower crown. Irrespective of canopy density, good kills were obtained in light populations, but poor kills in very heavy ones. Other invertebrates killed are listed, and classified as beneficial, indifferent, and harmful.

781. OSSOWSKI, L. L. J. **The chemical control of the Wattle bagworm *Kotochalia* [*Acanthopsyche*] *junodi* (Heyl.) by aerial spraying. II. The use of toxaphene and endrin in the earlier stages of an infestation.** *Bull. ent. Res.* 49 (2), 1958 (229–33). 5 refs.

[Cf. *F.A.* 18 No. 1876 and preceding abstract.] Replicated plots were sprayed with 2 oz. of endrin, and 1·5, 2·25, 3 and 6 lb. of toxaphene/acre, each in light diesel oil. All arthropods falling from sample trees were collected on sheets, identified and counted. Nearly two-thirds of these (exclusive of bagworms) were beneficial. Except for the significantly lower bagworm mortality with 1·5 lb. of toxaphene, bagworm kills with these treatments were similar, ranging from 96·6 to 98·5% which, however, are not sufficient to reduce the population to its endemic level.

782. NEISWANDER, R. B. **The distribution and control of bagworms [*Thyridopteryx ephemeraeformis*] in Ohio.** *J. econ. Ent.* 51 (3), 1958 (367–8). 4 refs.

Defoliation of ornamental Arborvitae and Junipers is generally only noted by house owners when larvae are well developed. At this stage dieldrin, 50% wettable powder, at 2 lb./100 gal. water, is more effective than the usual Pb arsenate. Malathion 57% emulsifiable concentrate (1 quart/100 gal. water) will kill most larvae even though feeding has stopped.

783. INOU(Y)E, M., and KOIZUMI, C. **[Studies on the Tsuga moth (*Dendrolimus superans* Butler) found at Tsubetsu in Hokkaido. (III)]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 8, 1957 (177–89). 15 refs. [Jap.jap.e.*e.*]

[Cf. *F.A.* 16 No. 3190, where called Pine moth.] A life-cycle diagram summarizes the 1952–55 observations. From the eggs laid by one moth, 62 larvae were raised in separate jars under uniform conditions and from these 19 adults developed, 17 in 12, and 2 in 23, months. Measurements from many individuals of (*a*) head capsule breadth, (*b*) dung diameter, and (*c*) dung weight, show for (*a*) independent single-peak frequency distributions for instars 1 to 4 but overlapping distributions for instars 5–7. The increases in (*a*) and (*c*) with each instar show linear trends with growth, the weight (*c*) in the last instar being ca. 30 times as much as that of the second, a measure of the increasing damage caused by the growing insect.

784. SIPPELL, W. L. **A study of the forest tent caterpillar *Malacosoma disstria* Hbn., and its parasite complex in Ontario.** *Abstr. of thesis*, in *Dissert. Abstr.* 18 (4), 1958 (1549). O.R.S.

785. SMITH, C. C. **Effects of spraying with DDT on fall cankerworm, aphids and mites.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 14 (2), 1958 (1).

Elms in Fredericton, New Brunswick, were heavily sprayed with 3% DDT water suspension from a mist blower with a rating of 28,000 cu. ft. of air per minute at 100 m.p.h. The spray killed practically all cankerworm [*Alsophila pometaria* larvae] and there was no further evidence of feeding after spraying. As a further check on the results, trees in the sprayed and unsprayed areas were banded with tanglefoot in the autumn and records kept of the numbers of ♀s trapped. Only one ♀ was taken in the sprayed area, compared with a maximum of 844 per tree in the unsprayed. Sampling was carried out to determine the effect on aphids and mites. The population of Elm aphid (*Myzocallis ulmifolii*) was many times greater on sprayed trees, and there was also an increase in the spider mite (*Paratetranychus ununguis*).

786. JEFFERS, J. N. R. **The application of sequential sampling to forest problems.** *Proc. 4th*

World For. Congr., Dehra Dun 1954, 3, 1956 [1958] (692–7). 1 ref. [E.]

Illustrates the method by its application to estimations of the population density of *Bupalus piniarius* in British Pine woods.

787. HUSSEY, N. W. **Effects of the physical environment on the development of the Pine looper, *Bupalus piniarius*.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (111–28). 24 refs.

Detailed studies of oviposition, larval feeding etc. were made with a view to elucidating the effect of climatic factors on the bionomics of *B. piniarius*. It was found that the minimum temperature for successful oviposition is 52° F., with optimum conditions lying within 64–73° and humidities of 79–95%. The larval feeding rate increases at higher temperatures, and the early instars feed more rapidly in damp conditions. The most suitable feeding conditions seem to be mild, damp nights on which dew forms at temperatures > 50°. The continental literature contains abundant evidence of the tendency for outbreaks to occur in warm, dry sites, but the results of the present study indicate that the preference of *B. piniarius* for dry areas is more apparent than real, since it is adapted to a wide climatic range. The apparent limitation of epidemics to dry areas must be due to indirect effects of weather on other biotic control factors (e.g. disease resistance) rather than to direct effects on the insect itself. [Cf. *F.A.* 16 No. 4321.]

788. BEVAN, D., DAVIES, J. M., and BROWN, R. M. [**Studies on *Bupalus piniarius***.] *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (69–72).

In laboratory observations of individual larvae of *B. piniarius*, 4, 5, 6 and even, in one case, 7 instar developments were recorded, and though it cannot be assumed that such behaviour would occur in the forest, *B. piniarius* must be added to the list of insects in which variation in the number of instars is known. In the course of these observations (made on a small number of insects) it was found that in the 5th instar, classically taken as typical, the sex ratio was 1/1, but in the 4th instar ♀s, and in the 6th ♂s were rare. The 4th instar is actually found in nature. Studies have been started on the parasites of *B. piniarius*. There appears to be a positive correlation between % parasitization and host numbers. The 3 most numerous parasites are *Cratichneumon nigritarius*, which attacks the pupa, and *Campoplex oxyacanthae* and *Heteropelma calcator*, which attack the larvae.

789. KLOMP, H. **On the synchronization of the generations of the tachinid *Carcelia obesa* Zett (= *rutilla* B. B.) and its host *Bupalus piniarius* L.** *Z. angew. Ent.* 42 (2), 1958 (210–7). 17 refs. [E.g.] O.H.

Discusses the life cycle of host and parasite. Synchronization was close at normal and abnormal temperatures, and not only with *B. piniarius* and *Semiothisa liturata*, both univoltine species, but also with bivoltine individuals of *Thera obeliscata*, suggesting that the development of the parasite larvae is activated by stimuli from the development in the host.

790. KUDLER, J. Vliv chemického boje na píd'alku tmavoskvrnáče (*Bupalus piniarius* L.) a na ostatní hmyz. [**Chemical control of *B. piniarius* and other insects.**] *Práce výzkum. Úst. lesn. ČSR* No. 13, 1957 (235–59). 48 refs. [Cz.russ.g.]

Describes the measures taken to control an outbreak in S. Moravia in 1953–55 by using DDT (25–30 kg./ha. dusting, 4–8 kg. 10% DDT/ha. mist spray). Comparable doses of BHC gave poor results.

791. PATOČKA, J. O morfológii a bionómii húsenic a kukiel môr z cel'ade Chloëphoridae. [**The morphology and bionomics of the larvae and pupae of the family Chloëphoridae [Cymbidae].**] *Lesn. Čas.* 3 (4), 1957 (292–316). 19 refs. [Slovak.russ.g.]

Describes and illustrates *Earias chlorana*, *E. vernana*, *Chloëphora bicolorana* and *Hylophila prasinana*, with notes on their distribution in Czechoslovakia and the damage they cause.

792. SILVER, G. T. **Studies on the silver-spotted tiger moth, *Halisidota argentata* Pack. (Lepidoptera: Arctiidae), in British Columbia.** *Repr.* from *Canad. Ent.* 90 (2), 1958 (65–80). 5 refs.

Description of the life stages, life history and natural control of this potentially dangerous defoliator of Douglas Fir in British Columbia.

793. DISSESCU, G. Cercetări de laborator pentru stabilirea eficacității insecticidelor cu bază de DDT şi HCH asupra omizilor de *Porthetria dispar* L. [**Laboratory tests of the efficacy of insecticides based on DDT and BHC on larvae of *Porthetria* [*Lymantria*] *dispar*.**] *Rev. Pădurilor* 1958 (2), (91–4). 3 refs. [Rum.]

Efficacy varied with the age of the larvae, being greatest against 1st and 2nd instars and less against 3rd and 4th.

794. GRUESCU, A. Vătămări cauzate arborilor de petrolul folosit la combaterea *Porthetriei* (*Lymantriei*) *dispar*. [**Injuries to trees caused by the oil used in gypsy moth (*L. dispar*) control.**] *Rev. Pădurilor* 1958 (4), (216). [Rum.]

Describes injuries to Alders, Poplars and Willows from the use of [diesel?] oil [in sprays?] to destroy the eggs of *L. dispar*. Bark necrosis was accompanied by discoloration of the wood and often followed by fungal infection. Research to find effective control methods that will not harm young trees is urged.

795. KUDLER, J. Boj proti bekyni mnišce (*Lymantria monacha* L.) toxickými proužky a aerosoly. [**Controlling *Lymantria monacha* with poison rings and aerosols.**] *Práce výzkum. Úst. lesn. ČSR* No. 13, 1957 (261–90). 32 refs. [Cz.russ.g.]

Describes experiments made in 1954–55 in two areas in Bohemia and Moravia threatened with fresh outbreaks of *L. monacha*. (1) In Loužna forest district Koch's poison-ring method [see *F.A.* 16 No. 3191] was tried on an area of 2 ha., using 20% DDT emulsion, diluted with water to 3–5%, sprayed on to the stems of attacked trees, ca. 3 weeks before the larvae were hatched, to form rings ca. 20 cm. broad at 4 m. above ground level. Despite very rainy weather, these rings retained their toxic

effect > 4 weeks. This method has the advantage of causing practically no harm to other insects; it is, however, expensive and gave kills of only 80–90% since some of the eggs of *L. monacha* are laid above 4 m. height. (2) Further trials were made with 10% DDT aerosol emulsion applied by a tractor-drawn generator working along rides (ca. 25 ha. at Loužna treated in 1954) and a small portable generator weighing 11 kg. when charged (1–2 ha. at Předín treated in 1955). In favourable weather with no wind, 4–5 kg./ha. of this emulsion gave kills of 90–97% of larvae in the first to third instars. Treatment by this method was 2–3 times as quick as motor dusting, which costs 3–5 times as much. The tractor-drawn generator is more suitable for old, somewhat open stands, and the hand generator for younger, denser stands. Early treatment, soon after the majority of the larvae have ascended into the crowns, is advisable; if treatment is delayed, other insects—especially useful ones—are likely to suffer serious losses.

796. KARAMAN, Z. Beobachtungen zum Auftreten der Nonne *Lymantria monacha* L. 1955/56 in den Buchenwäldern Westmazedoniens, Jugoslawiens. **[The *L. monacha* outbreak of 1955/56 in the Beech forests of West Macedonia, Jugoslavia.]** *Z. angew. Ent.* 42 (2), 1958 (236–8). [G.g.e.] O.H.

The outbreak, which completely defoliated 12,000 ha., was restricted to a zone between 1200 and 1600 m. alt. and was terminated by a polyhedral disease. Silver Fir in mixtures was also attacked, but not Ash, Oak, Alder, Aspen, or isolated pure stands of Spruce. Larvae on Silver Fir were less diseased than those on Beech.

797. HUGER, A., and KRIEG, A. Über eine Cytoplasma-Polyedrose der Nonnenraupe (*Lymantria monacha* L.). **[A cytoplasm polyhedrosis of *L. monacha*.]** *Naturwissenschaften* 45 (7), 1958 (170–1). 2 refs. [G.] O.R.S.

Examination of infected larvae showed polyhedrosis in the cytoplasm of the mid-intestine, apparently caused by a virus of the *Smithia* group.

798. TORRENT, J. A. Tratamientos de la procesionaria del pino (*Thaumetopoea pityocampa* Schiff.). **[Control of *T. pityocampa*.]** [*Docum.*] *6th Sess. FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/69-B*, 1958. pp. 10. [Span.]

Gives results of a number of experiments with different methods of control, and tabulates recommended insecticides, methods of application, and costs of treatment for different types of conifer stand (spraying with endrin from the ground for young stands, spraying from the air with endrin for pole-stage, and mature stands; and, for regions with a mild winter, dusting with DDT in addition to spraying).

Coleoptera

See also Nos. 730–1, 826, 1174–5.

799. EICHHORN, O. Anobien-Larven als Zapfenschädlinge an Weisstanne. **[Anobiid larvae damaging cones of Silver Fir.]** *Anz. Schädlingsk.* 31 (8), 1958 (124). 4 refs. [G.]

Notes on damaged cones of Silver Fir presumed to have been attacked by anobiid larvae (species unidentified).

800. JACQUIOT, C. Anomalies de structure provoquée chez des pousses de chêne par des extraits d'organismes parasites. **[Structural abnormalities caused in Oak shoots by extracts of parasitic organisms.]** *Proc. 8th int. bot. Congr. 1954 Sect. 11–12*, 1957 (164–5). [F.]

Two substances extracted from the frass of larvae of *Agrilus biguttatus* were injected into Oak shoots. The first substance produced malformations comparable with those caused by *A. biguttatus* under natural conditions. The second provoked the formation in the underlying wood of tissue structurally similar to that found in natural tumours.

801. LYON, R. L. ***Melanophila californica***. *For. Pest Leafl. U.S. For. Serv.* No. 24, 1958. pp. 7. 1 ref.

Notes on life cycle, habits, hosts, damage, and control measures.

802. BAKKE, A. **Mass attack of *Brachonyx pineti* Payk. (Col., Curculionidae) on Pine forests in Norway**. *Medd. norske Skogforsøksv.* 15 (2) (No. 50), 1958 (121–42). 17 refs. [E.e.nor.]

Discusses damage by *B. pineti* to Pine forests in Oslo fjord, the morphology, biology and parasites of this weevil, and its control by a 10% DDT solution applied from a Todd Insecticidal Fog Applicator.

803. THOMPSON, R. T., and STYLES, J. H. ***Otiorrhynchus niger* (F.) (Col., Curculionidae) in Britain**. *Ent. mon. Mag.* 94 (1131), 1958 (183).

A record of the insect on Sitka Spruce in Northants; the larvae attack the roots, and the adults feed on the leaves. It is believed to be the first British record of the insect, which is normally found in the mountainous regions of Central and S. Europe.

804. GÓRNAŚ, E. O łatwym zabiegu skutecznego zwalczania smolika znaczonego. **[The control of *Pissodes notatus* by a simple and effective method.]** *Sylwan* 101 (10), 1957 (60–6). [Pol.russ.e.]

Pointed [unbarked] Pine stakes 139–175 cm. long and 5–12 cm. thick, driven into the ground by their thicker ends to a depth of 20–35 cm., proved successful traps giving a mean catch of 90·2 and 44·5 insects per stake in 1955 and 1956 respectively. Traps should be in place from early April to about mid-July; barking 2 weeks after the pupae are first seen is recommended. *From author's summary.*

805. JAYNES, H. A., and MACALONEY, H. J. **White Pine weevil [*Pissodes strobi*]**. *For. Pest Leafl. U.S. For. Serv.* No. 21, 1958. pp. 7. 3 refs.

Notes on hosts, damage, life history, and control.

806. CHARARAS, C. Étude sur une maladie cryptogamique de *Leperesinus fraxini* Panz. et de *Dryocoetes autographus* Ratz. (Col. Scolytidae). [A

cryptogamic disease of *L. fraxini* and *D. autographus*.] *Rev. Path. vég.* 36 (3), 1957 (145–55). 14 refs. [F.g.] I.M.I.

The morphology and conditions for laboratory culture of the hyphomycete *Paecilomyces* (*Spicaria*) *variotei*, the apparent cause of important mortality in *L. fraxini*, are described. Experimental infections of this insect and of *D. autographus* gave mortalities of 50 and 80% (controls 0 and 25%) respectively.

807. MASSEY, C. L. **Four new species of *Parasitylenchus* (Nematoda) from Scolytid beetles.** *Repr.* from *Proceedings of the Helminthological Society of Washington* 25 (1), 1958 (26–30). 10 refs.

808. INOU(Y)E, M., and NOBUCHI, A. **[Studies on the natural enemies of the bark beetles and borers. (I)]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 8, 1957 (190–204). 25 refs. [Jap.e.e.]

In 1954 high winds blew down > 6 million bd. ft. in Hokkaido. The ensuing plague of bark beetles and borers spread into, and killed, standing trees. Important predators are the clerid *Thanasimus substriatus*, the trogositid *Themnochila japonica*, and the staphylinid *Metoponcus maximus* (all described and figured).

809. JOHNSON, N. E. **Ambrosia beetle infestation of coniferous logs on clearcuttings in northwestern Oregon.** *J. For.* 56 (7), 1958 (508–11). 7 refs.

Sample logs of (1) *Pseudotsuga taxifolia*, (2) *Tsuga heterophylla*, (3) *Abies grandis* and (4) *Thuja plicata* on sites from 700 to 2800 ft. alt., were found to be infested by ambrosia beetles of the genera *Trypodendron*, *Gnathotrichus* and *Platypus*. Frequency of attack, measured by the presence of 1 or more holes per sq. ft. of log surface was: (1) 93%, (2) 91%, (3) 89% and (4) 38%. Intensity of attack, measured by the average number of holes per sq. ft. of log surface, was (1) 10·5, (2) 6·6, (3) 6·9 and (4) 1·3. Details of the preference of the 3 genera of beetles for the logs by log size, species and bark thickness are given, and variations in the number of attacks with the season of felling and duration of exposure are noted. *Trypodendron* penetrated shallowly, and *Platypus* deeply, *Gnathotrichus* being intermediate.

810. SCHEDL, K. E. **Bark and timber beetles from Malaya.** *Malay. Forester* 21 (2), 1958 (99–105).

Lists 29 new records, and describes the following new species: *Ericryphalus rugosus*, *Carposinus tenuis*, and *Xyleborus micrographus* on *Shorea gysbertiana*; *X. triangi* on *Balanocarpus heimii*; *X. curvidentis* on *S. leprosula*; *X. cuneiformis* on *Shorea* spp.; *Platypus lunatipennis* and *P. pasaniae* on *Pasania sundaica*.

811. SANTORO, F. H. Especies de Platypodidae y Scolytidae (Col.) en maderas misioneras. **[Species of Platypodidae and Scolytidae found in timber from Misiones.]** *Ingeniería Agronómica, Buenos Aires* 15 (3), 1957 (23–6). [Span.]

Notes on the type of damage caused, and lists of species found in Misiones in 1953 and 1954, with their hosts.

812. SANTORO, F. H. Contribución al conocimiento de la biología de *Platypus sulcatus*. **[The biology of *P. sulcatus*.]** *Rev. Invest. for., B. Aires* 1 (3), 1957 (7–20 + 5 plates). 11 refs. [Span.]

Presents the results of a 1956 study in plantations of *Populus* × 'A.M.' in Buenos Aires province, giving information on signs of infestation, damage caused, alternative hosts, minimum diameter of tree attacked, biology and life history of the pest and mechanical control.

813. INOU(Y)E, M., and NOBUCHI, A. **A revision of *Cryphalus* species injurious to coniferous trees from Hokkaido, Japan (Coleopt., Scolytidae).** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 103, 1957 (45–56 + 2 plates). [E.jap.]

Contains a key and descriptions of the 7 species (3 new), usually secondary on the branches of felled and dying trees, but occasionally attacking terminal shoots and stems of healthy young trees. [Cf. *F.A.* 4 p. 129.]

814. HENRIKSEN, H. A. Sitkagranens vækst og sundhedstilstand i Danmark. **[The increment and health of Sitka Spruce in Denmark.]** *Forstl. Forsøgsv. Danm.* 24 (1), 1958. pp. 371. 4½ pp. of refs. [Dan.dan.e.e.]

Investigations were made on some 45 plots in different parts of Denmark. A yield table, based primarily on permanent sample plots, but strongly supported by temporary ones, is presented and compared with English, German and American tables. A comparison of growth in different parts of the country showed little relationship of soil texture to site class for soils having clay contents between 2 and 25–30%, but differences in site class were closely connected with differences in early growth rate. It seems doubtful whether water deficiency is a primary cause of site-class reduction. Generally speaking, no connexion was found between magnitude and fluctuations of volume increment and stand health and stability, heavy attack by insects and disease occurring in some of the most vigorous stands. On the other hand, stand health appeared to be connected with site type and locality; e.g. on one plot *Dendroctonus micans* developed appreciably more slowly on flat, temporarily waterlogged parts than on sloping ground where increment was greatest. Spells of drought appeared to be, on occasion, a primary cause of death, and the increasing severity of attack by *D. micans* with increasing age may be related to the progressive susceptibility to water deficiency of the trees as they grow taller. The greater severity of attack in heavily thinned stands may be attributed to the larger crowns and to the broken canopy, allowing free air movement, both of which contribute to the risk of water deficiency. Regional differences in attack could also be due to water relationships, e.g. in W. Jutland water deficiency may be caused by the strong winds, and the sandy soils have only a small reserve of water. The lack of correlation between water deficiency and site class, on the other hand, may be due to the fact that temporary setbacks caused by lack of water are of no permanent importance to growth unless they give rise to

pathological conditions. Measures suggested to prevent water deficiency and subsequent attack by *D. micans* are: light thinning; shelter belts of broad-leaved trees or stable conifers; and the selection of drought-resistant provenances.

815. SCHÖNHERR, J. Ein aussergewöhnlicher Schaden durch *Dendroctonus micans* Kug. **[An unusual injury from *D. micans* Kug.]** *Anz. Schädlingsk.* 31 (6), 1958 (88–90). 4 refs. [G.]

Injury and death of 25- to 30-year grafted *Picea pungens* var. *glauca kosteri* was caused by attack of *Dendroctonus micans* at the point of union of the scion with the *glauca* rootstock. The insects penetrated both upwards to the stem and downwards to the root collar, where a swelling and a more or less thick callus had formed. Near-by trees of *P. pungens* var. *glauca* raised from seed were unattacked. Chemical control of such attacks has so far proved difficult. Injured trees are best felled and burned (including the roots). Repeated spraying with a contact insecticide is a useful prophylactic measure.

816. WICHMANN, H. E. Untersuchungen über *Ips typographus* und seine Umwelt. *Thectura cuspidata* (Coleopt. Staphyl.). **[Investigations on *I. typographus* and its environment. *T. cuspidata*.]** *Z. angew. Ent.* 42 (2), 1958 (231–5). 8 refs. [G.g.e.] O.H.

A description of *T. cuspidata*, which is found in cambial fissures under the bark of many broadleaved and coniferous trees. It is not an associate, predator or parasite of barkbeetles. *From author's summary.*

817. LÜDERS, W. Engerlingsbekämpfung mit betriebseigenen Mitteln. **[Control of cockchafer larvae with equipment on the farm.]** *Z. angew. Ent.* 42 (1), 1958 (1–88). 32 refs. [G.g.] O.H.

Discusses the effect of soil cultivation in cultivated fields on larval instars (chiefly of *Melolontha melolontha*), timing, equipment etc. The 2nd and 3rd stages can only be controlled by disk harrows and similar implements.

Hymenoptera

See also Nos. 758, 760.

818. KUDELA, M. Hubení ploskohřbetky smrkové (*Cephaleia abietis* L.). Insecticidy ve vztahu k jejím přírozeným nepřátelům. **[Chemical control of *Cephaleia abietis* L. Insecticides in relation to its natural enemies.]** *Práce výskum. Úst. lesn. ČSR* No. 12, 1957 (193–247). 42 refs. [Cz.cz. russ.g.]

Gives results of work carried out during 1953–56 in the Obora area (760–880 m. alt. in the Erzgebirge) where power dusting with a BHC preparation (8%; 14 kg./ha.) repeated within 3 days in warm, sunny weather, resulted after 24 hours in 81–90% mortality of ♀s. Applications of 45 kg./ha., while reducing by 10–12% the larvae in the tree crowns, chiefly of the 1st and 2nd instars, at the same time killed up to 60% of the parasite population. Consequently, in these treated stands, parasite infection was reduced by ca. 7%, whereas in untreated stands it rose by 11–24%. Costs (in Kčs/ha.): One power dusting of flying ♀s, 37·50, aerial dusting, ditto, 64; power dusting of larvae 120·30, aerial dusting, ditto, 122.

819. CEBALLOS, P. Observaciones de la lucha contra el *Diprion pini* (L.) en 1957. **[The control of *D. pini* in 1957.]** [*Docum.*] *6th Sess. FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM*/69-*C*, 1958. pp. 4. [Span.]

Gives a short account of studies in biological control, and lists the parasites found on *D. pini* in Spain; also describes laboratory studies with a number of insecticides, and gives a short account of successful control in the field using a portable 'F.L.' type duster and 12% BHC (2% γ isomer), Hexalo [BHC type] or chlordane.

820. PETERSEN, B. B. Bladhvepsen *Lygaeonematus abietinus* Christ. 2. Fortsatte bekæmpelsesforsøg og disses indvirkning på parasiteringen af larvestadiet. **[*L. abietinus*. 2. Continued control experiments and their effect on parasitization of the larval stage.]** *Forstl. Forsøgsv. Danm.* 25 (1), 1958 (47–61). 8 refs. [Dan.dan.e.*e.*]

The experiments already described [see *F.A.* 19 No. 2087] continued in 1955–56 on an area of 21 ha. Spraying was done in June, from the air, with 20 litres parathion/ha. in a concentration of 0·85%. The costs, including hire of a landing ground, flying, chemicals etc. amounted to Kr.50/ha. A comparison of the dead larvae on sprayed and unsprayed areas showed that control was excellent in 1955 and only slightly less good in 1956. In 1955 the % of larvae parasitized in the sprayed areas was twice that in the unsprayed and the number of parasite eggs per larva was unusually high, but the absolute number parasitized, and consequently the number of adult parasites hatching, was only ca. $\frac{1}{10}$ of that on the unsprayed areas. As a result, in 1956 parasitization was about normal, with 38·5% of the larvae affected, and 94% of these carrying only one parasite egg. The 2 ichneumonid parasites studied, *Polyblastus flavicauda* and *Eclytus exornatus*, appeared late, after the spraying had taken place. In 1957 the sprayed area showed more damage by sawflies than neighbouring untreated ones, possibly as a result of invasion from other areas. Results suggest that the dispersion ability of the adult sawfly is high and that of the ichneumonid parasites low.

821. KOLUBAJIV, S. Příspěvek k bionomii, ekologii a gradologii smrkových pilatek skupiny Nematini. **[On the bionomics, ecology and epidemiology of Spruce sawflies of the group Nematini.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (2/3), 1958 (123–50). 51 refs. [Cz.russ.g.]

An account of investigations on: (*a*) *Pachynematus scutellatus*, (*b*) *P. montanus*, and (*c*) *Pristiphora abietina* during the outbreak in Czechoslovakia in 1948–52. Most damage was caused by (*a*) and least by (*c*). Predictions were made on the course of the outbreak on the basis of counts of overwintering larvae made in autumn and spring in sample plots of soil and litter. The counts showed a steady fall in the proportion of (*a*), and an increase in that of (*c*). Though many parasites were present, their effect was relatively small. The black-headed gull,

Larus ridibundus, was an important predator of the feeding larvae of (*a*), and the fungus *Spicaria verticilloides* parasitized the overwintering larvae of all three sawflies.

822. KOLUBAJIV, S. Boj se smrkovými pilatkami pozemním a leteckým poprašováním a použitím aerosolů. **[Control of Spruce sawflies of the group Nematini by dusting from the ground and from the air, and by using aerosols.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (4), 1958 (193–212). 44 refs. [Cz.russ.g.]

DDT contact-poison dusts were used during the outbreak of *Pachynematus scutellatus*, *P. montanus* and *Pristiphora abietina* in Czechoslovakia in 1948–55, against both the larvae (at 30–50 kg./ha.) and the imagos (15–20 kg./ha.). Results are tabulated. The imagos were far more susceptible than the larvae, and dusting during the flight period was also more advantageous because it did less damage to the natural enemies of the sawflies. The results of a successful small-scale aerosol trial against *Pristiphora abietina* are also tabulated.

823. BENSON, R. B. **A new European species of *Pachynematus* Konow (Hymenoptera, Tenthredinidae) feeding on Spruce (*Picea*).** *Bull. ent. Res.* 49 (2), 1958 (301–3). 4 refs.

Describes, with drawings of diagnostic features, *Pachynematus styx* sp. nov. belonging to the small species group of Spruce-feeding sawflies previously comprising only *P. montanus* and *P. pallescens*.

824. BENNETT, W. H. **The Texas leaf-cutting ant [*Atta texana*].** *For. Pest Leafl. U.S. For. Serv.* No. 23, 1958. pp. 4. 5 refs.

Notes on morphology, life history, damage and control (mainly by fumigation with MeBr).

Diptera

See also Nos. 87, 760.

825. GUILE, C. T. **Button top midge in Willows.** *Plant Path.* 7 (2), 1958 (50–1 + 2 photos). O.B.D.

An infestation of *Salix triandra* by the midge *Rhabdophaga heterobia* was discovered in Nottinghamshire in 1955. Damage was caused to Willow rods by galling or buttoning of terminal buds. There are two main broods, the larvae of the first probably overwintering in the soil. Trials with DDT sprays in 1957 indicated that control of the first generation can be obtained with a minimum of 3 early sprays during the first half of May, giving unhindered growth of rods, which are rendered less liable to damage from the second generation in July.

459. Other Animals

See Nos. 700, 730, 785.

46. Damage by Man

See No. 720.

48. Injuries Due to Unknown or Complex Causes

See also Nos. 377, 723.

826. JAHN, E., and DONAUBAUER, E. Über das gegenwärtige Lärchensterben in Österreich. **[The recent dying-off of Larch in Austria.]** *Allg. Forstztg.* 69 (15/16), 1958: *Suppl.* (*Informationsdienst* No. 11). pp. 2. 3 refs. [G.]

The high mortality of single trees, groups and whole stands of Larch in many parts of the Tyrol, Salzburg and Styria in 1957 and 1958 is attributed in the first place to abnormal weather—late frosts followed by sudden heat—which caused high susceptibility to fungal attack. *Hypodermella laricis*, *Dothichiza pityophila*, *Dasyscypha willkommii* and an *Ophiostomella* species resembling in mode of life *Ceratostomella ulmi*, were found on dying or dead trees. Areas of high mortality sometimes, but by no means always, coincided with areas of previous *Semasia diniana* outbreaks, while other areas attacked by *S. diniana* recovered completely. Control by felling infected trees, burning slash and painting stumps and cross-sections with carbolineum is recommended, together with trap-trees for bark-beetle control, as these are thought to spread *Ophiostomella*.

827. GIBSON, I. A. S. **Dead top in Kenya Pine plantations.** *E. Afr. agric. J.* 24 (1), 1958 (47–52). 17 refs.

Tabulates for 235 plantations of *P. insignis* and 163 of *P. patula* the % incidence of symptoms similar to those associated with *Diplodia pinea*. Pairs of leaders in the early and later stages of damage were examined and the major fungal colonists listed. Fourteen isolates from these, including a *Diplodia* sp. (not *D. pinea*) were used for inoculation experiments, all proving negative. Temperatures for their optimum mycelial growth are recorded. The same saprophytic colonists were found in the forest litter. It is concluded that dead top is widespread, but not serious, in Kenya, with no known instance of death ensuing. Slight differences from *Diplodia* die-back symptoms may be due to the absence of the secondary invader *D. pinea*, the absence probably being due to the cooler climate and the lower humidities at the hotter periods in this region. The Kenya symptoms correspond closely to those described in Australia [cf. *F.A.* 19 No. 1864], which are ascribed to restriction of water supply; greater incidence in Kenya east of the Rift and generally at canopy closure support this explanation. The study does not exclude the possibility of *Diplodia* die-back occurring in Kenya, but indicates that it is much less likely than supposed. The hotter coastal regions and parts of Tanganyika and Uganda are not considered here.

828. ZAK, B. **Littleleaf of Pine [*Pinus echinata*].** *For. Pest Leafl. U.S. For. Serv.* No. 20, 1957. pp. 4. 8 refs.

A short review—species affected, symptoms, economic importance, cause, control. [Cf. *F.A.* 20 No. 723.]

829. MOLNAR, A. C., and MCMINN, R. G. **The current status of pole blight [of *Pinus monticola*] in British Columbia.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 14 (3), 1958 (3–4).

Examination of plots established in 1949 revealed signs of recovery in almost all cases. The cause of

the disorder is still not clear, but many summers from 1940 to 1951 had rainfall below and temperatures above the average, whereas recent summers have been moister and cooler. The current reduction in rate of disease intensification and apparent improvement in vigour of some trees suggest that climatic cycles may have provided an underlying cause or predisposition for decline.

830. **White Pine blight.** *Rep. Stheast. For. Exp. Sta. 1957*, 1957 (38).

Preliminary results of a study of blight in areas in Tennessee exposed to industrial fumes and in fume-free areas in Virginia indicate that symptoms are very similar, except that old needles are shed earlier in Tennessee. There was no significant difference in S content of needles between areas.

831. LINZON, S. N. **Volume growth of needle-blighted and healthy White Pine trees at Mattawa, Ont.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 14 (2), 1958 (2).

A study of 55 healthy and 55 needle-blighted trees showed that mean diam. growth between 1949 and 1953 was 0·74 and 0·26 in. respectively, and volume m.a.i. % was 4·29 and 1·53 cu.ft. The reduction is held to be due largely to the reduced size and number of functioning leaves in the diseased trees. Trees affected for several years in succession bear progressively weaker foliage, which in extreme cases may consist of dwarfed needles of the current year only. The cause of the disorder is unknown.

832. GODMAN, R. M. **Changes in Yellow Birch top-dying Upper Michigan 1954–1957.** *Tech. Note Lake St. For. Exp. Sta.* No. 527, 1958. pp. 2. 1 ref.

Data after 4 years show the progress of top-dying [see *F.A.* 17 No. 3088] to be related to the intensity of cut. The % of top-dying trees reached a peak within a year after onset in virgin and moderately cut stands, and is now decreasing. In heavily cut stands, i.e. with a residual b.a. of < 50 sq. ft., top-dying continued to increase till the 3rd year and then remained stable. There is a higher % of injured trees in the diam. class $\geqslant 15$ in., but the smaller classes show the heaviest mortality, usually dying within a year of the initial injury. The top-dying may be related initially to an unusually prolonged high water-table in 1954, causing heavy rootlet mortality. Observations are being continued to determine the correlation of water-table fluctuations with tree behaviour and stand conditions.

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

See also Nos. 1, 5.

52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

833. ZELETIN, P. I., *et al.* Tabele dendrometrice. **[Mensurational tables.]** Editura Agro-Silvică, Bucharest. 1957. pp. 132. [Rum.] From *review* in *Rev. Pădurilor* 1958 (3), (169–70).

Includes (1) tables for calculating girth, b.a., and volume of round logs from diam., or from mid-diameter and length; (2) general volume tables for Silver Fir, Norway Spruce, Beech, Birch (*Betula verrucosa*), Aspen, Willow (*Salix caprea*), Oak, Hornbeam, Maples (*Acer platanoides* and *A. campestris*), Ash, Lime, Turkey Oak (*Quercus cerris*), Alder, Robinia, and White, Black and hybrid Poplars; (3) taper tables, and (4) yield tables, for the principal commercial species; all based on Rumanian material.

521. Diameter (Girth) and Sectional Area

See also No. 839.

834. MÜLLER, G. Untersuchungen über die Querschnittsformen der Baumschäfte. **[Investigations on the cross-sectional shape of tree boles.]** *Forstwiss. Cbl.* 76 (1/2), 1957 (34–54). 18 refs. [G.g.]

Deduces excentricity factors (actual sectional area/sectional area for a circle of equivalent circumference) for cross-sections whose shape is elliptical, ovate, or a combination of parabola and circle, and develops tables and graphs for determining theoretical excentricity factors when the difference between max. and min. diameter is known either for an individual tree or for the mean tree of a stand. As compared with (1) the actual b.a. of the stand, (2) the b.a. calculated by treating girth as the circumference of a circle should theoretically show systematic positive differences: these differences, however, are considerably smaller than the average difference of ca. 3% found, in both older and more recent studies, between results obtained by (2) and by ordinary calipering (3). It is regarded as very probable that the greater part of the apparent positive error given by (2) is attributable to systematic errors in (3), resulting e.g. from calipers sticking and the method of rounding off measurements. Apart from the usually positive systematic error of ca. 0·3–0·5%, (2) gives less dispersion of values and is freer from subjective factors. The negative errors exceptionally found for individual trees by method (2) are explained by a cross-section formed by a combination of circle and parabola. Improved accuracy in increment determination can be attained by method (2), and steel girthing tapes are cheaper than calipers.

835. BORGESON, A. E., COLCLOUGH, D. M., and YOUNG, H. E. **A field test of the Bitterlich variable plot cruising method in Maine.** *Tech. Note Univ. Me. For. Dep.* No. 48, 1958. pp. 4.

Tests were made in 50 stands of varying composition, structure, and density (data tabulated) and the results (*a*) compared with tape measurements of trees on a ¼-acre plot in each stand (*b*). Time taken for (*a*) averaged 13·3 min. and for (*b*) 31·6 min. For all 50 plots combined, b.a. as measured in (*a*) was 10% higher than that obtained by (*b*), the difference on separate stands varying from + 87·5% to − 24·5%.

836. STAGE, A. R. **An aid for comparing variable plot radius with fixed plot radius cruise designs.** *J. For.* 56 (8), 1958 (593). 3 refs.

Constructs and explains a diagram from which it is possible to determine the plot area on which trees of a particular diameter class are tallied (*a*) on fixed-radius plots, and (*b*) by angle-count using different b.a. factors.

837. HREN, V. Ocjena stanja sastojine i jačine uzgojnog zahvata uz pomoć frekvencijske krivulje. **[Estimating the condition of the stand and the intensity of silvicultural treatment by means of frequency curves.]** *Šum. List* 82 (1/2), 1958 (5–14). 6 refs. [Croat.e.]

Describes a method whereby the b.a. frequency curve for all the trees in a stand (sum of b.a. plotted against d.b.h. for each diameter gradation: determined from sample-plot measurements) is drawn, together with the b.a. frequency curve for the good trees (estimated ocularly by crown and stem form). The condition of the stand and the necessary thinnings are deduced from the relationship of these two curves. Examples of interpretation are given. In stands that are too young for d.b.h. measurement, these frequency curves may be based on number of trees instead of b.a., and height instead of d.b.h.

522. Height, Length

See also Nos. 839, 882.

838. POPOVIĆ, B. Nepravilna primena metoda najmanjih kvadrata pri određivanju visinske krive sastojine. **[Incorrect application of the method of least squares in determining stand height curves.]** *Rad. poljoprivred.-šum. Fak., Sarajevo* (*Šum.*) 1*B* (1), 1956 (161–75). 4 refs. [Serb.esper.]

Height curves were estimated using a shortened form of the method of least squares, and also the author's correction of the shortened form. A comparison was made with data from sample plot measurements and the S.D. of each method was determined.

524. Determination of the Volume of Trees and Stands

524.1. Principles of Volume Determination. Form (Taper)

See No. 833.

524.3. Volume of Tree Groups and Stands

See also Nos. 218, 833.

839. DUHOVNIKOV, JU., and ILIEV, A. Vărhu goleminata na stepenite na debelina i otstojanieto meždu visočinnite razredi i značenieto im za točnost-ta pri kubiraneto i sortimentiraneto na iglolistni dărvostoi. **[On the size of diameter classes, and the height-class interval, and their influence on the accuracy of volume and assortment determinations in softwood stands.]** *Nauč. Trud. lesoteh. Inst., Sofia* No. 5, 1957 (85–93). 6 refs. [Bulg.russ.]

Investigations showed that in measuring diameters, a systematic and preponderantly positive error was made in rounding off. As regards height, the large variations, even within a single stand, made it difficult to assess the importance of the magnitude of the height-class interval. For stands with a mean diameter of 10–18 cm., the recommended intervals are 2-cm. diameter classes and 2-m. height classes.

840. DITTMAR, O. Eine Studie über die 'graphischen' Massenermittlungsverfahren Speidelsche Massenkurve und Kopezky-Gehrhardtsche Massenlinie (= K.G.-Linie) an Hand einer Kiefernkahlschlag-Vollsektionierung. **[The Speidel volume/d.b.h. curve and the Kopezky-Gehrhardt volume/b.a. line, graphic methods of determining volume, studied against actual volumes, measured in sections in clear-felled Scots Pine.]** *Arch. Forstw.* 7 (2), 1958 (130–45). 16 refs. [G.g.russ.e.]

Breast-height diameters (cm. classes) were measured in 0·5 ha. of uniform 100-year Pine which was then clear-felled and the 139 stems measured accurately for volume. A detailed statistical analysis is presented to show that the volume-line law is completely valid for this stand. The linear correlation of single-stem volume with b.a., and the second-order equation relation of this volume with d.b.h. are equally valid. The former is preferred for simplicity in use. The deviation of single-stem volumes of both methods $\approx \pm 10\%$ and to get an accuracy in volume determination of $\pm 2\%$ requires ca. 100 sample stems.

841. MÜLLER, G., and ZAHN, E. Ein gute Ausgleichsfunktion zur Konstruktion von Massentafeln. **[A good equation for smoothing values in the construction of volume tables.]** *Forstwiss. Cbl.* 77 (5/6), 1958 (188–91). 8 refs. [G.]

An analysis of the Bavarian volume tables, confirming the applicability of Schumacher and Hall's logarithmic volume equation to European conditions, and demonstrating how the plotting of height and diameter data on double logarithmic paper facilitates the construction and use of volume tables.

842. TAKATA, K. **[Studies of the volume estimate by basal area at breast height (3). On the universal monovariate volume table.]** *J. Jap. For. Soc.* 39 (7), 1957 (255–9). 4 refs. [Jap.jap.e.]

Discusses the problem of generalizing from local volume-table data and develops an equation based on close correlations between the parameters a and b in the local volume equation $v = a + bg$ and the mean height and mean b.a. of a stand.

843. ČOKL, M. Prirejene Alganove in Schaefferjeve tarife ter njihova raba pri inventarizaciji sestojev. **[Adapted Algan/Schaeffer tariffs and their use in stand inventories.]** *Zborn. Inst. gozd. lesn. Gospod. Sloven.* No. 2, 1957 (165–95). 20 refs. [Sloven.g.]

Presents and describes adapted Algan/Schaeffer tariffs in which the number of tariff classes is limited to a minimum, and which give relatively similar accuracy (7%) for all site classes, species and stand structures. Ten tariff classes are taken for even-aged and for selection forest and a series of constants, representing the volume of a tree of 45 cm. d.b.h. on different sites, is calculated. On this basis tables are constructed for 5-cm. diam. classes, from

10–15 to 95–100 cm. These tables can be used to calculate tree volume in the round, timber volume and total stand volume. Their use is explained.

844. PETERSON, G. **Board-foot volumes of White Fir [*Abies concolor*] to an 8-inch top.** *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 30, 1958. pp. 2. 1 ref.

Presents a volume table based on data from 259 trees from the Lincoln National Forest, N. Mex. Logs were scaled in 16-foot lengths to a top diam. of 8 in. u.b.

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

See also Nos. 303, 315, 835–6, 1293.

845. ROLLET, B. Pour un inventaire forestier du Viet Nam. **[Preliminary studies for a forest inventory of Viet Nam.]** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (639–66). 10 refs. [F.]

Presents data obtained, and discusses methods used (sampling, statistical analysis etc.) in several pilot-scale enumerations in the sparse forests of southern Viet Nam, and the *Pinus merkusii* forest of Cambodia, with notes on the distribution of dipterocarps, and the possibility of making use of aerial photographs.

846. AQUINO, R. R., and GARCIA, A. S. **The progress of timber inventory.** *Filipino For.* 9/10, 1958 (91–2, 110–2 + 3 dgms.).

Gives some account of the progress and methods of the Philippine forest survey now in progress.

847. DAWKINS, H. C. **The extensive sampling of closed high forest as developed in Uganda.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (630–5). 4 refs. [E.] [Cf. *F.A.* 19 No. 779.]

848. LINDSEY, A. A., BARTON, J. D., JR., and MILES, S. R. **Field efficiencies of forest sampling methods.** *Ecology* 39 (3), 1958 (428–44). 28 refs.

A large-scale map of an undisturbed 20-acre stand of White Oak/Beech/Sugar Maple was sampled intensively by 9 forest sampling methods. The number of units and number of trees required for 15% S.E. were computed. Each method was timed in the actual stand to determine time per tree. The total number of stems of all species required for 15% S.E. for a selected dominant species multiplied by the time per stem gave a total time-at-units figure for each method. To this was added the time required to make the circuit of the required number of sample units; the sum is the field time, the inverse of field-statistical efficiency. For sampling the density and basal area of *either* Sugar Maple *or* Beech with 15% S.E., the methods ranked in the following order of field time: (1) combination of the rangefinder circle and the Bitterlich method, 2·04 hr.; (2) $\frac{1}{10}$-acre rangefinder circle, 3·41 hr.; (3) $\frac{1}{5}$-acre strip 3·65 hr.; (4) full Bitterlich, 3·66 hr.; (5) quarter method [see *F.A.* 18 No. 247] 4·36 hr.; (6) $\frac{1}{5}$-acre square, 5·17 hr.; (7) $\frac{1}{10}$-acre square, 5·81 hr.; (8) $\frac{1}{40}$-acre circle, 6·85 hr.; and (9) $\frac{1}{40}$-acre square, 9·84 hr. [See also *F.A.* 18 No. 4407.] *Authors' summary.*

849. MUTARELLI, E. J. Utilización del parcelamiento lineal en la organización de cuarteles en la Selva Misionera. **[The use of strip sampling in the laying out of compartments in the forests of Misiones.]** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (636–8). [Span.]

525. Volume by Assortments. Merchantable Volume

See also Nos. 715–6, 879.

850. WORLEY, D. P., SCHMIDT, O. A., and DUHNKRACK, A. R. **Tree grade cruising possibilities from a study in second-growth White Oak.** *For. Prod. J.* 8 (7), 1958 (214–6). 5 refs.

A study based on 45 stems of d.b.h. 10–24 in. Best correlation for lumber-grade recovery was given by the product of d.b.h. and number of select faces (faces with only one visible defect in the bottom 16 ft.). Though the error in determining the 'quality index' [cf. *F.A.* 15 No. 4306] of single trees may be great, for a 100-tree sample it would be ± 2 only.

851. DUHOVNIKOV, JU. Opitni sortimentni tablici za belija bor u nas. **[Experimental assortment tables for *Pinus sylvestris* in Bulgaria.]** *Nauč. Trud. lesoteh. Inst., Sofia* No. 5, 1957 (67–82). 3 refs. [Bulg.russ.]

Presents the basic data used in constructing the tables, describes how their accuracy was tested on 28 sample plots, and explains how to use them.

852. BORZEMSKI, E. Metodyka opracowania tablic sortymentowych dla drzewostanów sosnowych. **[Methods of preparing assortment tables for Pine stands.]** *Roczn. Nauk leśn.* No. 18, 1957 (157–85). 9 refs. [Pol.russ.g.]

Presents a method, based on mean diameter, mean height and stand volume, for calculating assortments as a % of total stand volume, and illustrates it from an actual stand.

853. MATSUI, Z., and BABA, K. **[The logging of telegraph poles from a Todo [*Abies mayriana*] taper table.]** *Spec. Rep. For. Exp. Sta., Hokkaido* No. 8, 1957 (111–8). [Jap.e.*e.*]

Derives from a taper table based on 4515 stems of 10–100 cm. d.b.h. and 10–35 m. height, and from logging from the characteristic stem group of each d.b.h. and height class, the basic formulae to calculate the number of standard telegraph poles 7·5, 8·0, 8·5 and 9 m. long, 12–23 cm. top diameter and of suitable taper, that can be got from each.

526. Log Measurement. Scaling

See also No. 833.

854. NISULA, P. Tukkien kuutioiminen tasaavaa kuutiojalkaluokitusta käytettäessä. **[Calculation of the volume of logs when using the Central Board of Forestry's rounding-off classification.]** *Commun. Inst. for. Fenn.* 48 (7), 1957 (1958). pp. 26. 5 refs. [Fi.e.*e.*]

Explains the method of calculating volume from

tally sheets in which log volumes are given to the nearest ½ or whole cu. ft., from log scales constructed by the Finnish Central Board of Forestry.

527. Solid Volume of Stacked Products (including Converting Factors)

855. ZIEGER, E. Untersuchungen über die Ermittlung des Festgehaltes von Schichtholz. [**Determining the solid volume of cordwood.**] *Holz-Zbl.* 84 (92), 1958 (1187–9). 11 refs. [G.]

Describes a method of computing the vertical surface of stacks of irregular height by measuring heights at regular intervals ('harp method'), its time consumption, accuracy, etc., and its use in combination with a divided wire frame [cf. *F.A.* 19 No. 475] for determining stacked measure. It is claimed that elimination of rectangular stacking permits great savings in labour with little loss of accuracy.

856. TUOVINEN, A. Puutavaran nippukuljetus johtaa nippujen mittaukseen. [**Transport of cordwood in bundles leads to the measurement of bundles.**] *Metsät. Aikak.* 1958 (3/4), (80, 83–7). [Fi.e.]

Three methods (illustrated) of measuring bundles were tested: cubing as a cylinder, (1) taking the diameter of its base as the mean value of the 2 longest diameters at right angles to each other; (2) measuring the base of the cylinder with a frame with cross-pieces forming rectangles at the corners; (3) estimating the base with a square frame, with diagonal cross-pieces. All results fell below those given by stacking bundles in a rectangular frame, by (1) 1·4%, (2) 1·85% and (3) 0·94%. Method (1) proved the most useful in practice; experiments continue.

857. MAKKONEN, O. Pinotiheystutkimuksia. I. Koivupaperipuut. II. Haapapaperipuut. III. Pienläpimittaiset kuusi- ja mäntypaperipuut. [**Studies on stacking density. I. Birch pulpwood. II. Aspen pulpwood. III. Small-sized Pine and Spruce pulpwood.**] *Julk., Metsäteho, Helsinki* No. 39, 1958. pp. 39. 9 refs. [Fi.e.*e.*]

On the basis of results of measurements (tabulated), mean stacking density values (ratio of solid volume of bolts in a stack to the volume of the stack) are given for the different species and for different standard lengths, applying to S. Finland only.

858. MAKKONEN, O. Aisattujen 2 m. koivupaperipuiden kuorettoman kiintokuutiomäärän ja pinokuutiomäärän suhde Pohjois-Suomesta hankitun aineiston perusteella. [**The ratio between solid (u.b.) and stacked cubic volume of 2-m. Birch pulpwood barked in strips on the basis of material collected in N. Finland.**] *Tied., Metsäteho, Helsinki* No. 147, 1958. pp. 9. [Fi.e.*e.*]

[Cf. *F.A.* 19 No. 2129.] About 52% of the stacked volume was solid timber.

53. Special Measurements of Trees and Stands (Crown Dimensions, Stand Density etc.)

See also No. 135.

859. VYSKOT, M., and ČIHAL, A. Příspěvek k otázce stanovení zápoje. [**On the problem of determining canopy closure.**] *Sborn. čsl. Akad. zeměd. (Lesn.)* 4 (1), 1958 (1–20 + 1 map, 2 plates). 21 refs. [Cz.russ.g.]

The accuracy obtainable in calculating the degree of canopy closure was investigated in 1953 and 1955 on six ¼-ha. plots in a 45-year Oak forest, using 4 methods: (1) measurement of the crown area of each tree from the ground, a schematic picture of canopy closure then being made on a plan; (2) planimetering the gaps between the crowns on a plan; (3) planimetering the crowns on an aerial photograph; and (4) using 100- and 625-dot grids on an aerial photograph. Methods (1) and (2) demanded a great deal of time and labour, but (1) was the only way in which vertical canopy closure could be determined with sufficient accuracy. Method (3) did not give accurate results and consumed a great deal of time; (4) was quick, simple, and sufficiently accurate, the 100-dot grid being better to use than the 625-dot. The degree of canopy closure is shown to be an important criterion for deciding silvicultural measures, e.g. thinning.

54. Assessment of Site Quality

See also Nos. 15, 223, 814, 1191.

860. MAGIN, R. Über die Brauchbarkeit des forstlichen Bonitätsbegriffs. [**The usefulness of the conception of site quality.**] *Allg. Forst- u. Jagdztg.* 129 (7), 1958 (145–50). 18 refs. [G.g.]

Discusses the effect of site factors (including wind), modes of establishment, and thinning, on the development of height and total yield, and concludes that the assessment of site quality by mean or (preferably) top height at a given age assumes a closer relationship between height and yield than is warranted by the facts.

861. BOROWIEC, S. Próba oceny wpływu niektórych czynników glebowych na bonitację drzewostanów sosnowych na utworach dyluwialnych. [**A tentative evaluation of the effect of some soil factors on the site class of Pine stands on diluvial formations.**] *Sylwan* 101 (9), 1957 (35–53). 20 refs. [Pol.russ.e.]

Factors studied in podzolic soils under Pine in the Katowice forest district, were the depth of the groundwater, the mechanical composition, and the content of available P_2O_5 and K_2O. Sample areas 50 × 50 m. were established round 75 representative soil pits, and height, age, and site class, using Schwappach's tables, were determined. The following conclusions were drawn: (1) Increase of available P_2O_5 did not affect site class, but site class increased on soils richer in K_2O. (2) Depth of the groundwater and mechanical composition of the soil were the chief factors affecting site class; the relationships are shown in graphs. (3) Study of the mechanical composition is of considerable value in determining forest site types on diluvial formations. *From author's summary.*

862. WHITE, D. P., and WOOD, R. S. **Growth variations in a Red Pine plantation influenced by a deep-lying fine soil layer.** *Proc. Soil Sci. Soc. Amer.* 22 (2), 1958 (174–7). 7 refs. O.R.E.

Differences in height, b.a., foliar K content etc.

between two parts of a 25-year *Pinus resinosa* stand on otherwise fairly uniform coarse glacial sand in the Upper Hudson Valley were closely related to the depth below the surface of a layer of silty fine sand. Where this was < 6 ft., the roots could obtain sufficient moisture and K. Where it lay deeper, deficiencies developed. *From authors' summary.*

863. COPELAND, O. L., JR. **Soil-site index studies of Western White Pine in the Northern Rocky Mountain region.** *Proc. Soil Sci. Soc. Amer.* 22 (3), 1956 (268–9). 6 refs. O.R.E.

A study of 37 plots indicated that site index (at age 50) was significantly correlated with effective soil depth, depth to the zone of reduced permeability, and the available-water-holding capacity of the top 3 ft. of soil. *From author's summary.*

864. ZAHNER, R. **Site quality relationships of Pine forests in Southern Arkansas and Northern Louisiana.** *For. Sci.* 4 (2), 1958 (162–76). 18 refs.

[Cf. *F.A.* 19 No. 3293; 16 No. 758.] Presents multiple regression equations from basic data, for the development of a method of site-quality evaluation for *Pinus taeda* and *P. echinata.* A field guide for its practical application has been published [see next abstract]. Site factors that help regulate soil moisture and aeration were highly correlated with site index. Among these, correlations with the following are detailed: *T* (= surface soil depth), *Cl* and *Sa* (= % clay and sand content of the subsoil respectively), *Si* (= silt % of the surface soil) and *Sl* (= % slope).

865. ZAHNER, R. **Field procedures for soil-site classification of Pine land in southern Arkansas and north Louisiana.** *Occ. Pap. Sth. For. Exp. Sta.* No. 155, 1957. pp. 17.

A pocket field guide for classifying Pine site quality in terms of soil and topographic characteristics.

866. HANSEN, N. J., and MCCOMB, A. L. **Growth of planted Green Ash, Black Walnut and other species in relation to observable soil-site characteristics in southeastern Iowa.** *J. For.* 56 (7), 1958 (473–80). 11 refs.

[Cf. *F.A.* 18 No. 4018.] Most of the soils in the area belong to the grey-brown podzolic group and usually have a fine-textured B horizon (clay-pan) 12–24 in. below the surface; on the upland ridges there are planosols, the surface layers of which are mostly loam or silt-loam, and the B horizons clay-loams or silty clays. The height and diam. growth of Green Ash were inversely correlated with the degree of erosion of the A horizon; there was great variation in growth on uneroded sites, where it was directly correlated with N content of leaflets. An empirical method of predicting early height growth of Green Ash was developed, using several soil and site characteristics. The growth of Black Walnut was significantly correlated with the texture and depth of the rooting zone, the presence of mottling and iron concretions, and the colour of the surface layers as indicative of the organic matter content. The correlation coefficients were, however, low, and it was impossible to predict the growth of the species on the basis of easily observed site characteristics.

867. SABROE, A. S. Bøgeboniteter. **[Beech quality class.]** *Dansk Skovforen. Tidsskr.* 43 (5), 1958 (248–57). [Dan.]

Presents graphs and tables based on current data and on records showing the changes (mainly increases) in quality class (C. M. Møller's classification) for different age groups, in Boller district since 1875. A separate analysis for the period 1933–1948 shows a considerable improvement in quality class for all age groups under 100 years.

55. Age Determination

868. KRALJIĆ, B. Suština i ekonomsko značenje, osobine i koristi od srednje starosti šumskog kompleksa i sastojine. **[The nature, economic significance, characters and use of the mean age of a forest or stand.]** *God. Zborn. zemj.-šum. Fak. Univ. Skopje (Šum.)* 10, 1957 (127–215). 66 refs. [Croat.croat.f.g.*f.*]

Discusses different methods of calculating the mean age of a forest made up of even-aged parts, the parts being of different ages, and concludes that Gümbel's method based on area is the correct one. Attention is drawn to the economic significance of the mean age of the stand for calculating costs and for estimating the value of standing timber.

56. Increment. Development and Structure of Stands

See also Nos. 218, 220, 229, 320–2, 335, 355–6, 359 *et seq.*, 490, 494, 502 *et seq.*, 534–5, 748, 776–7, 938.

869. KRAMER, H. Wegebreite und Zuwachs im angrenzenden Bestand. **[The effect of width of forest roads on increment in adjacent stands.]** *Allg. Forst- u. Jagdztg.* 129 (6), 1958 (121–34). 17 refs. [G.g.e.]

A study based on 108 temporary sample strips along roads (or rides) in pure Spruce or Beech in many parts of Lower Saxony. The effects were noticeable only on the marginal trees proper, and varied with road width, and age and density of stands. In general, heights and diameters of marginal trees and hence, despite increased taper, standing volume on 10-m. roadside strips, tended to be greater along roads from 5 to 20 m. wide. A reduction of standing vol./ha. became noticeable in Spruce when the unstocked area was > 5 m. wide, in Beech when > 12 m. wide.

870. PETRI, H. Zum ertragskundlichen Verhalten der Fichte im Nordteil Rheinland-Pfalz. **[The yield of Spruce in the N. part of Rheinland-Pfalz.]** *Mitt. Forsteinrichtungsamt Koblenz* No. 7, 1957. pp. 136 + 11 pp. of tbls., 1 dgm. 146 refs. [G.g.]

A study, based chiefly on 121 temporary sample plots in the Hunsrück-Eifel-Westerwald-Taunus region where Spruce is not indigenous, mostly concerned with the effect of stand density on increment as influenced by site conditions. On the whole Wiedemann's tables for moderate thinning fit reasonably well, but on good sites with plentiful water, b.a.i. might with advantage be maintained 20% higher, and on poor (dry or shallow) sites, 10–30% lower.

871. KORSUŇ, F. Věk a přírůst v Karpatských přírodních lesích. [**Age and increment in Carpathian natural forests.**] *Práce výzkum. Úst. lesn. ČSR* No. 13, 1957 (67–91 + 36 gphs.). 9 refs. [Cz.russ.g.]

Presents and discusses some results of measurements made in 1935–37 in the Stužica, Javorník, Pop Ivan, Bystrica and Polonský forest nature reserves, on 21 sample plots (total area 88 ha.) giving figures based on a total of 2065 trees (1170 Silver Fir, 840 Spruce and—owing to the difficulty in taking increment borings—only 55 Beech). These natural forests are extremely uneven-aged, and ages from 1 to 200–400 years may be represented in a continuous series. The figures obtained showed the youngest age class to be the most and the oldest the least numerous. General formulae are deduced which relate d.b.h., height, and volume, and the c.a.i. of these values, to age. As compared with even-aged, managed stands, the culmination of c.a.i. was found to occur at considerably higher ages, height increment culminating first, then diam. increment, and volume increment last. In contrast to even-aged stands, the increment of trees in these natural forests was maintained, after its culmination, at a considerable level, and individual trees grew on to unusually large dimensions. With decreasing altitude the increment in d.b.h., height and volume of individual trees of Spruce culminated later; for Silver Fir the reverse was true, but particular trees of both species eventually reached greater ages and greater dimensions at the lower altitudes. From the incomplete figures for Beech it is only possible to conclude that with decreasing altitude the [maximum] height and diameter increase, as does also the height of trees of a given diameter.

872. VUOKILA, Y. Etelä-Suomen hoidettujen kuusikoiden kehityksestä. [**On the development of managed Spruce stands in southern Finland.**] *Commun. Inst. for. Fenn.* 48 (1), 1956 (1958). pp. 138. 188 refs. [Fi.e.*e.*]

The second National Forest Survey has shown that Spruce is spreading rapidly in Finland, chiefly at the expense of Pine, and Finnish foresters have to decide whether this natural development should be allowed to continue or should be interfered with in the interests of business or the national economy. The purpose of the present investigation was to contribute to the solution of this problem by studying the development of pure, even-aged managed Spruce stands of natural origin on the *Oxalis-Myrtillus* (OMT) and *Myrtillus* (MT) types. (The term 'managed stand' refers here to one repeatedly thinned from below.) The results (*a*) are compared with those of (*b*) natural unmanaged Spruce, (*c*) artificially regenerated Spruce, and (*d*) repeatedly thinned Pine. The sampling methods and statistical treatment of the data are fully discussed, and the results set out in 22 tables and 13 graphs with Finnish and English legends, and there is a 19-page English summary. The more important findings are as follows. If a natural Spruce stand is treated with thinnings from below, at least 30% of the total growth of the stand may be removed in these intermediate cuttings, but the greater part of this is in the form of firewood and pulpwood, and only 11–14% of the total yield of sawtimber is removed in thinnings during a 60-year rotation, though this rises to 40% in a 100-year rotation. Comparison of (*a*) with (*c*) indicates that artificial regeneration of Spruce is not to be recommended in Southern Finland on any site where it will regenerate naturally. Comparison of (*a*) with (*d*) shows that Spruce grows at least as much stem wood as Pine on MT sites; consequently Spruce is the more desirable species on sites better than the MT type, and Pine on the poorer sites. Great differences were found between (*a*) and (*b*), partly due to stagnation during the seedling stage and poor self-thinning in (*b*). During rotations of ⩾ 60 years, (*a*) stands produce 40–42% more stem wood than (*b*) on OMT sites and 16–24% more on MT types. In spite of thinnings, the sawtimber volume of (*a*) exceeds that of (*b*) up to the age of 90 in the OMT, and 100 in the MT type; at age 100, it is 84–95% of (*b*), depending on site type.

873. MIHAJLOV, I., and GOGUŠEVSKI, M. Dendrometrijski proučuvanja na molikata (*Pinus peuce*, Griseb.) na Planinata Perister. [**Yield studies on *P. peuce* in the Perister mountains.**] *God. Zborn. zemj.-šum. Fak. Univ. Skopje* (*Šum.*) 9 (8), 1956 (107–85 + 12 tbls.). 26 refs. [Maced.maced. g.*g.*]

Presents data on stand structure, b.a. and volume/ha., height and diameter development, form etc., based on 7 sample plots in pure stands and in mixtures with Silver Fir, and on stem analyses. Its high yield in early years (m.a.i. ca. 10 cu.m./ha. at 30 years) and excellent timber properties make it a promising species for mountain afforestation outside its range.

874. BISPE LARIGUET, M. El crecimiento de *Populus euramericana* I-154 en tierra firme de la Provincia de Buenos Aires, Argentina. [**Growth of *P. x euramericana* I-154 on *terra firma* in Buenos Aires province, Argentina.**] *Rev. for. argent.* 2 (2), 1958 (43–4). [Span.]

Presents the results of measurements made on 2 plots (each of 408 sq.m.) of 14-year-old *Populus* 'A.M'. (*P. euramericana* cv. I-154) on a fertile, compact, clayey soil, rainfall ca. 850–11,000 mm. annually and minimum temperatures of − 3·4° C. The results show a possible yield of 5970 linear m. [log length]/ha., of which 20% would be in logs > 6 in. diam.

561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

See also No. 648.

875. LIN, W. C. [**Studies on the growth of Bamboo species in Taiwan.**] *Bull. Taiwan For. Res. Inst.* No. 54, 1958. pp. 29 + 1 tbl. 12 refs. [Chin.e.*e.*]

Measurements were made over 3 years on *Phyllostachys edulis*, *P. makinoi*, *Leleba dolichoclada*, *L. oldhami*, *L. dolichomerithalla*, and *Dendrocalamus latiflorus*. Results, showing total and mean daily height growth, variations in growth at different times of day, and the effect of climatic factors (temperature, humidity and rainfall) on growth, are given in graphs and tables.

876. REYES, M. R. **Some useful derivation and application of diameter growth of commercial dipterocarps in Basilan Working Circle. (From the first periodic growth data taken from five sample plots [on logged-over areas].)** *Filipino For.* 9/10, 1958 (3–7, 22–6, 33 + 1 tbl.). 2 refs.

The table prepared from the sample-plot data shows (1) diam. at time of logging, (2) p.a.i. in cm., (3) years in class, (4) age at diam. class, (5) diam. reached after 5, 10, 15 . . . 100 years, (6) number of years needed to reach diam. class (50, 60 or 70 cm.). The derivations are briefly explained to serve as a guide in their use or in preparation of similar tables for other forest tracts. Several applications of the table are illustrated, e.g. evaluation of sustained yield, prediction of diam. and volume in x years' time, analysis and choice of diam. groups to be cut or left.

877. JAZEWITSCH, W. VON, BETTAG, G., and SIEBENLIST, H. Eine neue Jahrringsmessmaschine mit elektrischer Messwertregistrierung. **[A new electrical recorder of annual ring widths.]** *Holz Roh- u. Werkstoff* 15 (6), 1957 (241–4). 4 refs. [G.g.e.] P.R.

This new automatic measuring instrument (illustrated) records in one operation, either as figures, or as points on semi-logarithmic paper. It differs from the instrument developed by B. Eklund at the Swedish Forestry Research Institute [cf. *F.A.* 12 No. 3501] and since manufactured by A/B ADDO, in that the microscope tube can be moved over the object without interfering with microscopic vision, despite the additional recording device.

562. Volume Increment

878. ALLISON, J. H. **Periodic annual growth of the upland types on the Cloquet Forest.** *Minn. For. Note* No. 68, 1958. pp. 2.

Gives figures for p.a.i. in cords per acre and value increment per acre, from 1939 to 1949, for 4 Jack Pine and 2 Red Pine types, mixed Pine, Pine plantations, conifer/hardwoods, Aspen, Aspen/Birch and upland Balsam, giving under each type separate figures for each species.

879. SPEIDEL, G. Die rechnerischen Grundlagen der Leistungskontrolle und ihre praktische Durchführing in der Forsteinrichtung. **[The mathematical basis and practical application of yield regulation by the method of periodic enumerations in management [of regular forests].]** *SchrReihe forstl. Fak. Univ. Göttingen* No. 19, 1957. pp. 118. 103 refs. [G.g.]

Discusses, largely on the basis of the work of Prodan and the Freiburg circle, methods of determining volume, diameter and value development with the help of volume tables, tariff series, etc., at reasonable cost and with sufficient accuracy. Formulae and tables of constants for taking into account the upward shift of volume curves with age, and methods of accounting for fellings between enumerations are presented. A method for measuring changes in stand structure, based on 5 classes of equal b.a. and their mean trees is suggested. Timber quality assessments are discussed and a method for determining value increment in terms of stemwood assortments available, based on computations of true-form-quotient series with the help of Hohenadl's form-quotient is discussed, supported by a nomogram relating the volume contained in different portions of the stem to true form-quotient at these heights. From the data so obtained a curve of mean prices/cu.m. (in index numbers) over diameter classes can be constructed. The improvement in timber quality occurring between enumerations, if sub-average trees are removed by thinning, is not overlooked. Practical execution is based on the enumeration, in 4-cm. gradations, of whole subcompartments, from 1 to 3 ha. in size, forming ca. 5% of the area and as 'representative' of it as possible (i.e. not chosen at random). The place of calipering on each tree is marked for future revisions. At the first enumeration 40–50 heights per sample area have to be measured, but only heights of a few mean trees at revisions. Timber quality assessment is usually confined to circular sample plots of 0·1 ha. (2 per ha.). To co-ordinate yield and site studies, soil and vegetation sampling is done at the same time. It is estimated that a team of 1 ranger and 2 workers can cover 4–5 ha. a day and that, with machine computation, the cost of this method is only ca. 10% more than that normally used in the preparation of working plans.

880. PARDÉ, J. Tarière de Pressler sans temps de passage. **[Calculation of volume increment from increment cores without taking account of recruitment period.]** *Rev. for. franç.* 10 (6), 1958 (399–409). 10 refs. [F.]

Discusses (1) the methods to be used in selecting sample trees, and taking, handling, and measuring increment cores, and (2) the method of calculating volume increment from the value of the diameter m.a.i. obtained from increment cores, as explained by Loetsch [cf. *F.A.* 15 No. 564].

881. TRAMPLER, T., and SIKORA, B. Pomiar bieżącego przyrostu miąższości na powierzchniach doświadczalnych. **[Measuring the current volume increment on experimental areas.]** *Roczn. Nauk leśn.* No. 18, 1957 (115–56). 12 refs. [Pol.russ.g.]

A new method is described in which increment is calculated from the formula

$$Z_v = \frac{V(P_g + c)}{100}$$

where Z_v = volume increment, V = stand volume, P_g = b.a. increment % and c is a constant. P_g is calculated from measurements at the beginning and end of the period concerned. The value of c is calculated from sample trees felled at the end of the period. Formulae are also given for calculating the mean error of the volume increment, b.a., and b.a. increment. The method proved to give accurate results and to be suitable for experimental use. *From authors' summary.*

566. Yield Tables and Their Construction

See also Nos. 814, 833, 901.

882. HUMMEL, F. C., and CHRISTIE, J. M. **Methods used to construct the revised yield tables for**

conifers in Great Britain. *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (137–41). 1 ref.

Gives a brief account of the methods used in constructing the recently published revised yield tables for conifers in Great Britain [cf. *F.A.* 15 No. 2758]. The main change from former methods was based on the discovery that, for British conditions and ranges of thinning, the relationship of top height on the one hand, and various crop characters such as total volume, total b.a., main crop volume, main crop b.a., stems/acre, standing crop form-factor, and mean girth, on the other, were independent of age or quality class. It was therefore possible to construct a 'master table' on the basis of top height, from which the yield tables for different quality classes could be devised. This method enables alignment charts for the estimation of standing vol./acre to be constructed for each species. That for Sitka Spruce is given as an example.

883. HAUGBERG, M. Produksjonsoversikter for osp: foreløpig rapport. [**Yield tables for Aspen: preliminary report.**] *Medd. norske Skogforsøksv.* 15 (2) (No. 50), 1958 (143–86). 17 refs. [Nor.nor.e.*e.*]

Presents tables based on material from 35 permanent sample plots for site classes II and III, and ages 18 to 70 years. It is emphasized that they are provisional and subject to correction when more material is available.

884. MATHAUDA, G. S. **The uneven-aged Sal [*Shorea robusta*] forests of Ramnagar Forest Division, Uttar Pradesh: their constitution, rate of growth and drain, along with empirical yield and stand tables for selection type of Sal crops.** *Indian For.* 84 (5), 1958 (255–69). 7 refs.

567. Stand Tables

See also No. 884.

885. KOLK, N. VAN DER. Een inhoudsverdeling over diameterklassen van de groveden. [**Volume distribution by diameter classes of Scots Pine.**] *Ned. Bosb. Tijdschr.* 30 (8), 1958 (225–34). 5 refs. [Du.e.]

Tabulated figures are given for volumes by (1) d.b.h. and (2) mid-diameter classes. The figures were obtained from Dutch yield tables, using equations derived from Mitscherlich [see *F.A.* 2 p. 78] and Nyyssönen [see *F.A.* 16 No. 465], and as these equations have not been tested for conditions in the Netherlands, the results must be considered as provisional.

568. Other Mensurational Studies of Stand Constitution and Changes Therein. Distribution of Growth by Tree Classes etc.

See also No. 879.

886. DENUYL, D. **A twenty year record of the growth and development of Indiana woodlands.** *Res. Bull. Ind. agric. Exp. Sta.* No. 661, 1958. pp. 52.

Illustrates by tables, diagrams and photographs, case histories of a number of representative stands. Trees are grouped in 3 size classes (saplings, poles, and sawtimber trees) and figures are given for each class and species, showing d.b.h. increment, changes in diam. class distribution of species, distribution of vigour classes etc.

58. Surveying and Mapping. Aerial Surveys

887. MUNGALL, A. G. **Modifications of the Tellurometer.** *Canadian Surveyor, Ottawa* 14 (2), 1958 (60–2). C.Po.

The Tellurometer [see *F.A.* 19 No. 2164] has been in use in Canada for about a year, and modifications have been developed to suit Canadian conditions: (*a*) the fitting of small thermostated ovens to surround the measuring crystals and permit the instrument to be used at low temperatures (down to − 40° F.); and (*b*) separation of the radio antennae from the rest of the instrument, so that they can be fixed to a light, portable mast, connected by cable to the instrument, and so operate above tree-top level. Neither adaptation was necessary in S. Africa, where the instrument was evolved, but they are essential in Canada. Details of the adaptations are given.

888. STELLINGWERF, D. A. **Report to the Government of Syria on aerial photographs for forest inventory.** Expanded Technical Assistance Programme, FAO, Rome. *FAO Report* No. 841, 1958. pp. 18 + 5 gphs. Limited distribution.

889. AVERY, G. **Forester's guide to aerial photo interpretation.** *Occ. Pap. Sth. For. Exp. Sta.* No. 156, 1957. pp. 41. 21 refs.

A practical guide to the use of aerial photography to supplement field work.

890. SIMONSSON, G. Om flygbildens arealnoggranhet. [**Accuracy of area measurements on aerial photographs.**] *Norrlands SkogsvFörb. Tidskr.* 1958 (2), (183–208). 3 refs. [Sw.sw.]

Areas were measured on aerial photographs (2 overlapping prints to each plot and for each flying height) taken at 2400, 3900, 5000 and 10,000 m., of 17 plots in Östad district, Älvsborg county. Tabulated figures show the % values of error of estimated vs. actual area, the mean values of the errors, and the S.D., when the photographs were used without correction, or with allowances for differences in scale, slope and tilt. Corrections for scale reduced the mean values of errors but not the S.D. Correction for slope and tilt had little effect on the results. The most accurate results were obtained for plots lying towards the centre of the photograph, or when measurements were made from 2 overlapping photographs. No systematic differences were found for the different flying heights.

891. SUTTON, C. E. Aplicación de la aerofotogrametría en el conocimiento de bosques subtropicales de la República Argentina. [**The application of aerial photogrammetry to obtain information on the subtropical forests of the Argentine Republic.**] *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (617–22). [Span.]

Includes notes on the identification of species and of forest types, scales, and costs.

892. FRANCIS, E. C. and WOOD, G. H. S. **Classification of vegetation in North Borneo from aerial photographs.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (623–9). 2 refs. [E.]

Describes the 16 vegetation types that can be identified on photographs on scales from 1 : 25,000 to 1 : 30,000.

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

See also No. 1.

61. Forest Management: General, Theory and Principles

See Nos. 318–9, 323, 499, 1293.

62. Working Plans. Annual or Periodic Yield. Yield Regulation

See Nos. 305, 897.

64. Forestry as a Business: General

See also No. 901.

893. **The implications of technical change in agriculture**. *Proceedings of the 9th International Conference of Agricultural Economics, Finland 1955*, 1956. pp. xiii + 571.

Includes papers on: The interdependence of agriculture and forestry (*N. A. Osara*); The impact of technical changes on woodland management (*W. E. Hiley*).

894. MATSUSHIMA, Y. **The economic nature of forestry**. *Bull. For. Exp. Sta. Meguro, Tokyo* No. 102, 1957. pp. 175. [Jap.E.]

A general discussion, drawing largely on Japanese instances, dividing the subject by (*a*) form of enterprise, (*b*) products, production techniques, form of disposal, purpose of forest land, etc., (*c*) location and accessibility to markets as affecting rent.

895. ABETZ, K. Der Einfluss der Waldbesitzgrösse auf den Eigenbedarf und die Marktleistung an Holz in bäuerlichen Betrieben. **[The relation of size of forest holding to owner consumption and market production of wood on farms.]** *Allg. Forstzeitschr.* 13 (23), 1958 (325–6). 1 ref. [G.]

Discusses some of the findings of the author's book on farm forestry [see *F.A.* 17 No. 1097] adding diagrams and a table to show how steeply the proportion of wood/ha. available for sale rises with the size of the holding, and suggests measures for reducing waste of wood on farms.

896. **Deer and pulp mills compete**. *Timberman* 59 (8), 1958 (44–6).

Describes, with a condensed form of contract, the multiple-use agreement made between the American Box Board Company and private owners, which include many hunting clubs, for the simultaneous maintenance of yields of Aspen pulpwood and of deer on the cut-over Red and White Pine area of Michigan's lower peninsula. The company enumerates, plans, manages, harvests, provides a constant market, subcontracts and supervises the logging, reports the volume yield, meets licenses, insurance, permits and accident liability, evaluates deer programmes, and is available for consultation, including new research. Where clubs are concerned, they guarantee a long agreement, title, entry for harvest and alteration at company expense of roads, if necessary. Deer food supply is greatly increased by disking for sucker regeneration and periodic thinning, some of which is timed for winter feeding. Pulpwood yields are rising.

65. Special Business Problems of Timber-Growing. Calculation of Costs and Profitability. Valuation

See also Nos. 218, 315, 461, 502, 513, 651, 878–9, 919.

897. BATIAS, J. Rendement financier et aménagements. **[Financial returns and working plans.]** *Rev. for. franç.* 10 (7), 1958 (481–92). [F.]

Discusses the effect, usually neglected in working-plan revision and often masked by the progress of currency inflation, of changes in demand, markets etc., on the return from forestry enterprises. The author analyses the financial returns for the 12 years 1946–57, of a communal forest consisting of 725 ha. coniferous forest and 344 ha. coppice-with-standards.

898. PATRONE, G. Sul tasso del frutto delle fustaie a lento accrescimento. **[The rate of income of slow-growing high forests.]** *Pubbl. Accad. ital. Sci. for.* [unnumbered] 1958. pp. 242. [It.f.e.g.]

A substantial monograph, divided into 4 sections, dealing with: (1) the rate of volume increment and the rate of financial return of artificially regenerated high forests of *Abies alba* and *Picea abies* managed on a rotation of the maximum volume production; (2) the same for *Quercus cerris* and *Fagus sylvatica* high forest managed on a shelterwood system; (3) the same for uneven-aged high forests of *A. alba*, *P. abies* and *F. sylvatica* managed on a selection system; (4) the security of income and capital resources invested in high forest managed on a long rotation. The illustrative data (presented in 34 graphs and 37 tables) are drawn from Italian forests. There is a 12-page English summary.

899. VEENENDAAL, H. Omloop, kostprijs en ondernemerswinst van de Douglas. **[Rotation, costs and profits of Douglas Fir.]** *Ned. Bosb.-Tijdschr.* 30 (6), 1958 (181–5). [Du.]

Presents current figures for prices, labour, and management costs, and yields, costs and profits for the financial rotation on different site classes, concluding that Douglas Fir, except on the poorest sites, is a profitable crop in the Netherlands.

900. SCHMITZ-LENDERS, B. Hohe oder niedrige Umtriebe beim Pappelanbau. **[Long or short rotations for Poplar plantations?]** *Allg. Forst- u. Jagdztg.* 129 (7), 1958 (163–7). 1 ref. [G.e.]

Compares net money yields for 50-, 60-, and 70-year rotations, in each case with 2 rotations of half that length, on the basis of financial yield tables for the Harff Poplar [*Populus regenerata* Henry]. At 4% compound interest, the longer rotation is generally more profitable, but two 35-year rotations would be better than one of 70 for the best sites. *From author's summary.*

901. MATSUI, Z., and SHINOHARA, H. **[On the management of Japanese Larch forest plantation by**

individual farmers in Nemuro Plain.] *Spec. Rep. For. Exp. Sta., Hokkaido* No. 8, 1957 (119–27). [Jap.e.*e.*]

Constructs, from local stem analyses and stand measurements, a yield table (B-grade thinning) from which to calculate a local dairy farmer's likely income from planting wind- and fog-breaks, fuel forest and wooded pasture, in this waste land. With 8 ha. planted, the table shows that he may expect to derive 30% of his income from forest products. The table covers 5–30 years, 2–22·7 cm. d.b.h. and 3–17·6 m. height; the final stand being 615 stems and 215 cu.m./ha. Main and total fellings are calculated at 7·4 and 11·9 cu.m./ha./year at 25 years.

902. MØLLER, C. M. Nåletræ contra løvtræ. **[Conifers versus deciduous trees.]** *Dansk Skovforen. Tidsskr.* 43 (6), 1958 (285–91). [Dan.]

[Cf. *F.A.* 19 No. 4011.] A further discussion of the economic aspect, citing figures for yield in cu.m. and weight of dry matter, profits, and capital value for Beech and Norway Spruce.

903. SELIN, L. Raakapuun kantohintataso maassamme vuosina 1934–55. **[Stumpage price level in Finland, 1934–55.]** *Commun. Inst. for. Fenn.* 48 (5), 1957 (1958). pp. 136 + 6 maps. 99 refs. [Fi.e.*e.*]

This investigation is the first attempt in Finland to observe the stumpage fluctuations of different types of timber in the raw-timber market. The results indicate that the material collected at the Forest Research Institute for forest taxation purposes will, at a very small additional cost, serve to provide continuous stumpage price statistics by types of timber. The 45 tables have English legends, and there is a 7-page English summary.

66. Costing of Logging Operations

See also Nos. 576, 592, 594, 604, 626, 908.

904. KOOLS, J. F. **Some considerations on the economy of tropical forest exploitation.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (604–7). [E.]

A brief discussion of transport costs.

67. Assessment of Financial Results; Book-keeping and Accountancy; Business Statistics; Short-Term Planning and Financing

905. STODDARD, C. H. **An estimate of capital needed in forestry to meet projected timber requirements for the year 2000.** *J. For.* 56 (7), 1958 (484–8). 8 refs.

It is estimated that a capital investment of $2100 million over the next decade, plus $40 million in annual protection outlays for a 40-year period, would produce an added 4000 million cu. ft. of growth per annum for the whole period to A.D. 2000.

68. Administration and Organization of Forest Enterprises

681. National (Federal, State) Forest Services and Administration.

906. WOBST, A. Zweckmässigkeit und Ergebnisse der Zusammenfassung örtlicher Betriebseinheiten. **[The suitability and results of grouping local management units.]** *Forstwiss. Cbl.* 77 (5/6), 1958 (172–8). 1 ref. [G.]

Analyses some of the costs and income figures (1953) of the Bavarian Wirtschaftsgruppen (administrative areas), and concludes that, though the present system works well if the areas are homogeneous, it might be better to divide Bavaria into administrative units based on the annual cuts and net revenues of the (272) individual forest districts, rather than as at present on purely spatially connected areas.

684. Labour Management

907. STEINLIN, H. Die Organisation der Waldpflegearbeiten im Forstbetrieb. **[Organizing tending operations in forestry.]** *Wald u. Holz* 39 (10; 11), 1958 (255–62; 268–71). [G.]

Taking as an example conditions in the instructional forest of the Eidgenössiche Technische Hochschule, Zurich, the author discusses the time required for planting, tending plantations, tending young growth and thickets, logging, road maintenance etc., assuming the need for ca. 1000 working days (or 4 full-time workers) per 100 ha. in intensively managed lowland forests, and the adaptation of the seasonal distribution of operations, traditionally based on the availability of seasonal agricultural labour, to conditions of a wholly or largely permanent labour force. As most of the tending jobs are seasonally tied, this often involves logging all the year round. Tending should be entrusted to selected highly trained workers equipped with suitable hand or mechanized tools, acting on definite, even if simplified, instructions.

686. Planning and Organization of Buildings, Transport Installations (Roads etc.)

See also Nos. 625–6, 869.

908. MATYÁŠ, K. Ekonomićky dosah různé hustoty cest pro lesní hospodářství. **[The economics of different road densities in forestry.]** *Sborn. čsl. Akad. zeměd.* (*Lesn.*) 4 (4), 1958 (283–92). 3 refs. [Cz.russ.g.]

Discusses lorry roads and skidding tracks, and expenditure on road building and maintenance. It is concluded that, within certain limits, a greater road density will be more economic than a lesser one, and that a limit to road density can be set by letting the skidding distance to lorry road be the maximum length that is still economic. [Cf. *F.A.* 19 No. 3339.]

7. MARKETING. ECONOMICS OF TRANSPORT AND THE FOREST PRODUCTS INDUSTRIES

See also No. 1284.

71. Marketing of Forest Products: General

See also Nos. 499, 1093, 1301.

909. ROBERTSON, B. R., SHULL, S. C., and BEAL, G. M. **Marketing of Maryland forest products.** *Miscellaneous Publication, Maryland Agricultural Experiment Station, University of Maryland, College Park* No. 288, 1957. pp. 62.

910. CHRISTENSEN, W. W., and GOODSPEED, A. W. **Marketing forest products in West Virginia.** *Bull. W. Va. agric. Exp. Sta.* No. 421, 1958. pp. 33.

72. The Quantitative Aspects of Marketing. Demand, Consumption and Supply

See also No. 1311.

911. **Year book of timber statistics 1957.** Timber Trade Federation of the United Kingdom, London. 1958. pp. 19.

Covers U.K. imports, production, stocks, and consumption.

912. **[United Kingdom review section.]** *Timb. Tr. J.* Ann. Spec. Issue, 1958 (113 . . . 294).

Contains detailed statistics, with discussion of the 1957 trade, in articles covering imports of timber and wood goods, softwoods and hardwoods, plywood, wallboard, veneer, and home-grown trades, the building and joinery industries, and mining timber supplies.

913. **[Overseas section.]** *Timb. Tr. J.* Ann. Spec. Issue, 1958 (89 . . . 105).

Contains articles, with statistics, on the 1957 timber trade of Sweden, the Netherlands and West Germany, the Anglo-Belgian trade, and the exports of France, Norway and Poland.

914. FRIEDRICH, A. G., HÄBER, J., and KASTEN, I. Holzimport aus West- und Äquatorial-Afrika. **[Timber imports from West and Equatorial Africa.]** *Schriftenreihe Deutsche Afrika-Gesellschaft e.V., Bonn* No. 5, 1958. pp. 44. 14 refs. [G.g.]

Includes data on the growth of German imports of tropical timber in the round, mostly for veneer and plywood, > 90% of which is derived from this region, supply and demand in the Common Market and its dependencies, the Free Trade Area, and other countries, port facilities in Ghana, Nigeria, French West and Equatorial Africa, and the Belgian Congo, freight rates etc. plus a special chapter on Okoumé, once forming ca. 80% of the total German imports from Africa, but today, though still the foremost species, only 30–35%.

915. CARULLO, F. Produzione forestale italiana e mercato comune europeo. **[Italian forest production and the European Common Market.]** *Ital. for. mont.* 13 (2), 1958 (53–62). [It.f.]

916. KABALIN, D. Drvo u našoj vanjskoj trgovini. **[Wood in the export trade of Jugoslavia.]** *Šum. List* 82 (3/4), 1958 (101–7). [Croat.e.]

Gives export figures for Beech cordwood and Beech and Fir sawn timber for 1957, and analyses recent trends in timber demand abroad.

917. **Annual foreign trade report (with some internal statistics) 1956. [Sudan].** Ministry for Social Affairs, Khartoum. 1957. pp. 353. [Arab.E.]

Includes data on gums, tanstuffs etc. as well as timber, and gives some meteorological data.

918. BETHEL, J. S., and BAREFOOT, A. C. **Can lumber compete?** *For. Prod. J.* 8 (7), 1958 (9*A*-14*A*). 9 refs.

Discusses the present and future supply and demand position in the U.S.A., assuming that timber prices will continue to rise faster than those of competing materials, and measures to ensure that timber remains competitive. These include improvement of yield per log, utilization of waste, savings of man power, better grading, and quality and dimensional control—the last, by avoiding excess thicknesses, would also increase yield per log.

73. Prices

See also No. 903.

919. ZIVNUSKA, J., and SHIDELER, A. **Is price reporting for standing timber feasible?** *J. For.* 56 (6), 1958 (393–8). 12 refs.

An analysis of the 1956 sales of standing Ponderosa Pine in the national forests of California failed to reveal any usable relationship between stumpage prices and factors such as volume of timber, % of Pine, density of cut, and length of log haul.

920. FEHRENSEN, W. Untersuchungen über das Verhältnis von Holzpreis und Holzdurchmesser. **[Relations between wood diameter and price.]** *Abstr. of thesis,* in *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 3, 1958 (66–70). [G.]

For Oak and Beech stemwood the price differences between large and small dimensions have tended, and are tending, to become smaller and the German price index figures [*Messzahlen*] are thought to need revising. The economic and technological reasons for these trends are discussed.

74. Trade Policy

See also No. 915.

921. **Tariff Board does not agree with sawmillers' claims.** *Aust. Timb. J.* 24 (5), 1958 (3 . . . 26).

The conclusions of the 1957 enquiry tabled in the Australian Commonwealth Parliament in May 1958 are printed *in extenso.* In the main the Board recommends no increases of duty on imported sawn timber. This is complementary to, rather than

competitive with, home-grown timber. Local sawmilling interests supply 80% of local demand, a proportion much greater than before 1939.

78. Economics of Transport

See also No. 914.

922. **Packaged timber: an experiment in shipment.** *Wood* 23 (7), 1958 (317).

[Cf. *F.A.* 19 No. 4701.] Details are given of the unloading at Rochester of a trial shipment of 188 standards of Swedish softwood of various dimensions, packaged to length and size in steel-strapped sets each containing $\frac{1}{2}$–$\frac{3}{4}$ standard. A rate of 38·940 standards per hatch was achieved in an 8-hour day with 2 men per hatch. Importers and exporters believe this method will reduce costs; further trial shipments will be arranged.

79. Economics of the Forest Products Industries

See Nos. 1096, 1200, 1217–20, 1284–8, 1301, 1309, 1313, 1336.

8. FOREST PRODUCTS AND THEIR UTILIZATION

See also Nos. 1, 231, 1284–8, 1309.

923. BROWN, N. C., and BETHEL, J. S. **Lumber.** John Wiley & Sons, Inc., New York; Chapman & Hall Ltd., London. 2nd ed. 1958. pp. xvi + 379. Price $9.00 (72*s.*).

A revised edition of a textbook [first published 1947: see *F.A.* 9 No. 2326] dealing with the fundamental principles and basic procedures followed in the manufacture, conditioning, grading, distribution and use of lumber in the U.S.A. New chapters on quality control and on the use of wood residues have been added.

924. CRUZ, E. DE LA, and HUNT, G. M. **The Philippine Forest Products Research Institute.** *For. Prod. J.* 8 (5), 1958 (41*A*–43*A*).

Covers history, administration, staffing etc.

925. **[Wood utilization.]** *J. For.* 56 (8), 1958 (547–83). 3 refs.

An issue devoted to wood utilization, containing the following articles: The use of wood in ships and boats (*J. G. Kuenzel* and *H. E. Worth*) [including a historical survey]; The U.S. Forest Products Laboratory (*J. A. Hall*); TECO [Timber Engineering Company] takes a new look at wood utilization (*C. A. Rishell*); The Institute of Paper Chemistry (*I. H. Isenberg*); Wood preserving and changing markets (*R. L. Osborne*); The Oregon Forest Products Research Centre (*J. B. Grantham*); Developments, trends, and problems in education and research in forest utilization (*R. J. Hoyle*).

81. Wood and Bark: Structure and Properties

810. General Information on Woods

See also Nos. 203, 221, 228–9, 364, 499, 1300.

926. THOMAS, A. J. **Tasmanian woods.** *Bull. For. Comm. Tasm.* No. 1, 1933 (reprinted 1955). pp. 22.

Reprint of a bulletin first issued in 1933, with notes on 8 hardwoods and 3 conifers.

927. ARKWRIGHT, P. **Know your timber: No. 51 Queensland Maple.** *Woodwkg. Ind.* 15 (5), 1958 (283). P.R.

Flindersia brayleyana and *F. pimenteliana.*

928. La page des bois tropicaux. Bété. **[Tropical woods. *Mansonia altissima* and *M. nymphaeifolia.*]** *Rev. Bois Appl.* 13 (6), 1958 (42). [F.]

929. Bois du Congo Belge. **[Timbers of the Belgian Congo.]** Union Professionelle des Producteurs de Bois du Congo Belge, Brussels. [1958.] pp. 111. [F.]

Includes a concordance of standard commercial and scientific names; an alphabetical index of commercial, vernacular, and scientific names; a concordance of the names chiefly used by each of 8 important agencies with standard commercial names; notes on nomenclature, principal commercial assortments, weight of wood in the round and converted, colour, uses, producers, and grading, for 66 species.

930. MCCOY-HILL, M. **Timbers of East Africa. Mkunde. Mfunda. Funtumia.** *Timb. Technol.* 66 (2229), 1958 (343).

Antiaris spp., *Cynometra webberi*, *Funtumia latifolia.*

931. **Specimen woods Nos. 271–273.** *Suppls.* to *Wood* 23 (7–9), 1958. Each pp. 2.

Bangawanga (*Amblygonocarpus obtusangulus*); Okwen (*Brachystegia nigerica*); and Rhodesian Copalwood (*Guibourtia* (*Copaifera*) *coleosperma*).

932. HUGHES, J. F. **A summary of the information available on the utilization of *Julbernardia* [*Isoberlinia*] *globiflora*.** *Util. Ser. Util. Div. For. Dep. Tanganyika.* No. 3 [1958?] pp. 4. 3 refs.

Covers sawlog qualities, physical, mechanical, milling and woodworking properties, durability, preservation and seasoning of this essentially heavy-construction timber, the flowers of which are the main source of the beeswax and honey crop (both of very high quality) of the Western Province.

933. **Mukusu, *Lovoa swynnertonii*.** *Timb. Leafl. For. Dep. Uganda* No. 34, 1958. pp. 2. 4 refs.

Covers distribution, frequency, timber properties, preservation, seasoning, suggested saws, and uses. The native name is proposed for the standard name.

934. **Munyakono, *Strombosia scheffleri*.** *Timb. Leafl. For. Dep. Uganda* No. 35, 1958. pp. 2. 2 refs.

Covers habit, distribution, frequency, timber properties, seasoning, preservation, suggested saws, and uses. The native name is proposed for the standard name.

935. KEYLWERTH, R., and NOACK, D. Holzeigenschaftstafeln, Greenheart. [**Tables of wood properties. *Ocotea rodiaei.***] *Holz Roh- u. Werkstoff* 15 (4), 1957 (203–4). 13 refs. [G.] P.R.

936. SBURLAN, D. A., and FLORESCU, I. P. Importanţa industrială a lemnului de carpen. [**The industrial importance of Hornbeam wood.**] *Rev. Pădurilor* 1958 (2), (67–71). 6 refs. [Rum.]

Discusses uses and properties of the wood. There are ca. 200,000 ha. of this species in Rumania.

937. LEHMAN, J. W. **Products from Hickory bolts.** *Hickory Task Force Rep. Stheast. For. Exp. Sta.* No. 6, 1958. pp. 20. 14 refs.

Presents information on size, quality, and grade of bolts, including chief defects, and prevention and control of insect attack, specifications for a number of products, manufacturing methods etc. Handles are by far the most important product. Others are sporting equipment, textile machine parts and picker sticks, spokes and axles, dowels, skewers, and ladder rungs.

811. Structure, Identification

See also Nos. 180, 186, 188, 1010–11, 1027.

938. MITCHELL, H. L. **Wood quality evaluation from increment cores.** *Tappi* 41 (4), 1958 (150–6). 16 refs. P.R.

Discusses research by the U.S. Forest Research Laboratory, on developing better methods and more efficient equipment for determining intrinsic quality from increment core samples. This work has been concentrated mainly on Southern Pines, Douglas Fir and Ponderosa Pine. Methods and equipment for the determination of specific gravity, fibril angle, fibril length and proportion of late to early wood are reviewed. *From author's summary.*

939. MAINIERI, C., and PEREIRA, J. ARANHA. Identificação das principais madeiras de comércio no Brasil. [**Identification of the principal commercial timbers of Brazil.**] *Bol. Inst. Pesqu. tec. S. Paulo* No. 46, 1958. pp. 189. 38 refs. [Port.]

Presents keys for the identification by hand lens of 234 Brazilian species. A list of commercial names with botanical equivalents is included.

940. JACENKO-HMELEVSKIJ, A. A., and BUDKEVIČ, E. V. Kratkij očerk stroenija drevesiny kataji serebrolistnoj (*Cathaya argyrophylla* Chun et Kuang). [**A brief outline of the wood anatomy of *C. argyrophylla.***] *Bot. Ž.* 43 (4), 1958 (477–80). [Russ.e.]

[Cf. *F.A.* 20 No. 175.] The wood anatomy is intermediate between that of *Picea* and *Pseudotsuga*, differing from the former in having spirally thickened axial tracheids and from the latter by dentate ray tracheids and narrower fusiform rays.

941. SEABRA, L. DE, FERREIRINHA, M. P., and FREITAS, M. C. P. G. DE. Contribuições para o conhecimento tecnológico da flora do ultramar. [**Contribution to the technical knowledge of overseas species.**] *Garcia de Orta, Lisboa* 5 (4), 1957 (711–26 + 4 plates). [Port.f.e.]

Presents information on the macro- and microscopic characters of the wood of *Acacia albida* and *Casuarina* sp. Tests of suitability for pulping gave unpromising results.

811.1. Anatomical Elements and Tissues

See also Nos. 122, 978–81, 1001, 1028, 1199, 1212, 1214.

942. CHOWDHURY, K. A. **Xylem gradient in the vegetative shoot of some tropical perennial plants.** *Proc. 8th int. bot. Congr. 1954 Sect. 7–8*, 1957 (247–9). [E.]

Presents information on the characters and dimensions of protoxylem, metaxylem and vessel members in *Acer oblongum*, *Nephelium litchi*, *Prunus puddum* and *Shorea robusta*.

943. SCHULZ, H. Der Anteil der einzelnen Zellarten an dem Holz der Rotbuche. [**The proportion of different types of cell in Beech wood.**] *Holz Roh- u. Werkstoff* 15 (3), 1957 (113–8). 8 refs. [G.g.e.] P.R.

A total of 15,000 counts on 30 cross-sections of Beech of all ages, ring widths and densities, yielded the following mean %'s: fibres (*f*) 42; vessels (*v*) 31; tracheids (*t*) 5; rays 17; longitudinal parenchyma (*l.p.*) 5. While age had no influence on these %s, wider rings increased the ray % markedly, but *t* and *l.p.* only slightly and only for rings of medium width; increasing density had a similar effect on *t* + *l.p.*, but considerably increased *f*, a 5–8% *f* increase corresponding to a mean density increase of 70 kg./cu.m. With comparable annual ring widths and densities, free-growing trees showed less *f*, but higher ray % and *l.p.* than those growing densely. Within an annual ring, the % of *v* alone decreased markedly from early to late wood, that of all others, particularly *f*, showing, on average, a steady increase. Even in the earliest part of the annual ring, *f* varied from 25 to 50% and this initial figure seems to have a direct bearing on the wood density produced in that year, during which *f* may vary widely, probably according to conditions during the current growing season.

944. BUCHER, H. Die Struktur der Tertiärwand von Holzfasern. [**Structure of the tertiary wall in wood fibres.**] *Holzforschung, Berlin* 11 (4), 1957 (97–102). 11 refs. [G.g.e.] P.R.

[Cf. *F.A.* 15 No. 4016; 17 No. 3200.] Separation of the tertiary from the secondary wall can be effected by swelling and dissolving; the outer layers of the fibre can be removed without deformation of the tertiary wall by differential staining (with Victoria Blue B) and partial swelling. The swelling medium (diluted HCl or NaOH) macerates the tertiary wall and makes its structure distinctly visible. The author discusses methods of determining the angle of inclination of the spiral structures. It was found that the angle between the longitudinal axis and the spiral is 30° and 65° for *Picea abies*, 65° for *Picea glauca*, 70° for *Pseudotsuga taxifolia*, 80° for *Abies alba* and *A. balsamea*, 84° for *Pinus sylvestris* and 89° for *Larix decidua*. Except in *Picea*, the spirals in the tertiary wall run less steeply than those in the secondary wall. In the tertiary wall they run left-hand; in the main layer of the

secondary wall right-hand; and in the outer layer again left-hand.

945. JONES, G. B. [edited by L. CHALK]. **Variations in cell size and cell wall thickness in Norway Spruce, *Picea abies* Karst.** *J. Oxf. Univ. For. Soc.* (*Ser. 4*) No. 6, 1958 (35–43). 2 refs.

Measurement on drawings made from projections was slightly more satisfactory than direct measurement with an eye-piece scale. Shand Micrometer readings tended to give higher values for wall thickness. In rings near the pith, wall thickness is low and shows only a slight increase in the latewood. In mature rings, wall thickness often decreases in the last 2 or 3 cells at the end of the rings. The latewood tracheids of slow-grown Swedish material had thicker walls than those of the British stems. Maximum lumen diameter often occurs after 10–20% of the ring has been formed; the diameter fluctuates widely throughout the ring and it is suggested that this may be associated with development from mother cells. Variation in cell size is closely associated with the % of wall present, and appears to be an important factor in the increase of density at the end of a growth ring. *Author's summary.*

946. BANNAN, M. W. **An occurrence of perforated tracheids in *Thuja occidentalis* L.** *New Phytol.* 57 (1), 1958 (132–4 + 1 plate). 3 refs. O.R.S.

An occurrence of perforated tracheids in the peripheral growth of the distal part of a large, lower branch of a mature tree is described in detail, with illustrations. The annual increments were very narrow and the condition persisted through 6 annual rings, total width 1·0 mm., after which the gap was closed. [Cf. *F.A.* 18 No. 4524.]

947. JACKSON, L. W. R., and GREEN, J. T. **Slash Pine tracheid length as related to position in stem and branch.** *Naval Stores Rev.* 68 (4), 1958 (6, 8).

The study was made to determine the reliability of tracheid length comparisons in stem and branch of Slash Pine as a criterion for selecting superior trees. In discs taken at breast height from a 45- and a 65-year-old tree the tracheid length increased rapidly from the first ring to peaks between rings 15 and 25, and then increased very slowly to the peripheral ring. In an 18- and a 22-year-old tree the range of variation in the first ring was very low at all heights sampled in the stem. In the 5th and 10th rings, the length increased to a certain height in the stem and then decreased to the top. In 3 Slash and Loblolly Pine parents used for breeding purposes, the tracheids in the 1956 branch- and adjoining stem-growth were highly correlated. When the stems of both species had long tracheids the branches also had longer tracheids than those of trees with short stem-tracheids. An analysis was made of the stem/branch tracheid-length relationship for the 1956 growth of 39 Slash Pines. Correlation coefficient was $r = 0{\cdot}7313$. The linear regression equation was $y = 0{\cdot}4613 + 0{\cdot}9034\ x$ in which y is the stem tracheids. These results showed that the tracheid length of the branch is highly related to that of the stem. The wide variation in tracheid length that exists between individual trees of similar characteristics suggests that it may be genetically controlled. *From authors' summary.*

948. HEJNOWICZ, A., and HEJNOWICZ, Z. **Variations of length of vessel members and fibres in the trunk of *Populus tremula* L.** *Acta Soc. Bot. Polon.* 27 (1), 1958 (131–59 + 3 gphs., 1 tbl.). 32 refs. [E.e.] O.B.D.

An analysis of 1720 mean values for length of fibres and vessel members in a 50-year-old Aspen showed that variations in length of these elements in the stem were of the same order as in other trees [cf. *F.A.* 16 No. 2152]. When the length of elements was related to the distance from the pith, the results were the same as those reported by Anderson for conifers [cf. *F.A.* 12 No. 2990]. The relationship between the length of initials and the relative age of the cambium, as well as the gradient of root influences modifying the relationship in the lower part of the stem, constituted the essence of the variations in the length of the tracheary elements. Upward, gradients of the length of elements in the same ring or in a group of rings of the same age in that part of the stem not influenced by the root, were due to the difference in the age of the cambium that had produced the elements. *From authors' summary.*

811.2. Special Features and Abnormal Structure

See also Nos. 987, 1213.

949. MERGEN, F. **Distribution of reaction wood in Eastern Hemlock as a function of its terminal growth.** *For. Sci.* 4 (2), 1958 (98–109). 21 refs.

The gradual erection through the growing season of the drooping leaders (by upward movement at the tip and by straightening from the base as the tissues harden) is illustrated from weekly plotting. Cross-sections cut at 3-in. intervals show that compression-wood tracts lie in the arc from which the leader drooped and they shift conformably as the horizontal orientation of the leader changes. Where drooping is prevented by pulling on the tip with a counterweight, no compression wood is formed. When leaders were subjected to alternate thawing and freezing and gently bent in the latter state (as the wind might do), rupture occurred between the normal and the reaction wood. Such minute fractures are the postulated origin of the common ring shakes in this tree.

950. **Tension wood in Hickory.** *Rep. Stheast. For. Exp. Sta. 1957*, 1957 (63).

Sectional analysis of (*a*) a 'splitter', (*b*) a straight 'non-splitter', and (*c*) a non-splitting leaner, indicated that (*a*) had gelatinous fibres present in 96% of all annual rings observed at all the 5 heights analysed, (*c*) in 16% at stump level, and 60% at 30 ft., and (*b*) 2% at stump level and 37% at 18 ft. Most gelatinous fibres were found in early wood, but they often continued into the late wood. [Cf. *F.A.* 17 No. 4545.]

811.4. Growth Rings. Early and Late Wood

See also Nos. 648, 943, 945, 974, 987.

951. MOLSKI, B., and ŻELAWSKI, W. Wstępne badania anatomiczne procesu kształtowania się

drewna późnego w 'słoju rocznym' siewek modrzewia (*Larix europaea* D.C.) w związku z warunkami długości oświetlenia dziennego. **[Preliminary anatomical investigations into the process of latewood differentiation in annual rings of Larch seedlings as influenced by day-length.]** *Acta Soc. Bot. Polon.* 27 (1), 1958 (83–102 + 1 tbl.). 3 refs. [Pol.e.]

Material from greenhouse-grown plants exposed to increased day-length was studied microscopically. The results indicated that there is no direct connexion between the process of late-wood differentiation and the photoperiodic reactions of the growing-point meristem. *From authors' summary.*

952. BUIJTENEN, J. P. VAN. **Experimental control of environmental factors and their effect upon some aspects of wood anatomy in Loblolly Pine.** *Tappi* 41 (4), 1958 (175–8). 11 refs. P.R.

Deals with the physiology of late-wood formation and with environmental factors that might change the anatomy of the wood formed. Experiments were carried out both with seedlings and mature trees. An increase in temperature caused a reduction in tracheid wall thickness in seedlings without influencing the diameter. Long photoperiods caused an increase in height growth but had no consistent effect on tracheid diameter and wall thickness. At the beginning of late-wood formation a number of mature trees were given treatments comprising continuous illumination and irrigation, but no effect on shoot growth or types of wood formed could be observed. It is suggested that a change in the condition of the tree itself may be responsible for the cessation of height growth and initiation of late-wood formation. *From author's summary.*

811.5. Sapwood and Heartwood

See also Nos. 95, 1014.

953. PHILLIPS, E. W. J., and SAVORY, C. A. **The effect of fungal decay on the benzidine test for distinguished heartwood and sapwood in Pine.** *For. Prod. J.* 8 (5), 1958 (157–9). 5 refs.

In Scots Pine samples incubated with *Lentinus lepideus* (1), *Coniophora cerebella* (2), *Fomes annosus* (3), and *Polystictus versicolor* (4), colour reactions were still clear after 3 months except in (1). Heartwood still showed red or reddish orange after 6 months in (2), (3) and (4), but in (2) and (3), the yellow sapwood reaction was obscured by severe decay. In (4), it remained particularly bright. Preservatives, particularly of the creosote type, tended to mask the reaction and sometimes produced a reddish colour on sapwood.

811.6. Texture, Grain, Figure

954. CASTIGLIONI, J. A. El diseño de las maderas. **[Figure in wood.]** *Rev. Invest. for., B. Aires* 1 (3), 1957 (21–44 + 13 plates). 12 refs. [Span.]

Names and defines types of grain, texture and figure in wood.

955. MATVEEV-MOTIN, A. S. Vnešnie priznaki krjažej s volnistoj svilevatost'ju. **[External indications of logs with wavy grain.]** *Derev. Prom.* 7 (3), 1958 (9). [Russ.russ.] P.R.

Logs [e.g. Birch] with radial and tangential wavy grain can be used for sliced veneers, but only tangential wavy grain is of use for peeled decorative veneer. Radial wavy grain can be detected by wavy fissures in the bark, or by tearing the grain of the wood; tangential wavy grain by the protuberances and depressions on the lateral surface, and by short, irregular, rib-like formations.

811.7. Phloem; Bark

See also Nos. 1005, 1014, 1265.

956. LEONOVA, T. G. K voprosu o vremeni založenija guttovmestilišč u bereskletov *Euonymus verrucosa* Scop., *E. europaea* L. i *E. maakii* Rupr. **[The age at which secretory canals are laid down in *E. verrucosus*, *E. europaeus* and *E. maakii*.]** *Bot. Ž.* 43 (3), 1958 (430–3). 5 refs. [Russ.]

The gutta-containing secretory canals of the phloem are laid down as early as the first month of life; they are rather larger and appear earlier in the root than in the stem. *E. verrucosus*, the slowest grower, produces secretory canals earliest and in the greatest numbers. *E. maakii* grows much faster, but is later in producing secretory canals. *E. europaeus* is intermediate in these characteristics. [Cf. *F.A.* 20 No. 1265.]

812. Physical and Mechanical Properties

See also Nos. 220, 938, 1025, 1186–7.

957. STINSKAS, B. A. Fiziko-mehaničeskie svojstva drevesiny sosny (*Pinus silvestris*) proizrastajuščej v uslovijah Litovskoj SSR. **[Physical and mechanical properties of *P. sylvestris* growing in Lithuania.]** *Trudy Akademii Nauk Litovskoj SSR, Vilnius* (*Ser. B*) 1 (9), 1957 (119–32). [Russ.russ.lith.]

Physical and mechanical properties were tested on a total of 8500 samples of Scots Pine growing in 3 associations: (*a*) *Pinetum myrtillosum*, (*b*) *P. vacciniosum* and (*c*) *P. cladinosum* in S.W. and S. Lithuania. (*a*) Showed the highest values, exceeding those of (*c*) by 6·5–21·8%. Differences between (*a*) and (*b*) were not significant. Wood properties were directly correlated with the number of annual rings/cm., % of late wood and density. Data are tabulated.

958. SAMORZEWSKI, J. Ciężar właściwy oraz wytrzymałość na ściskanie i zginanie statyczne krajowego drewna bukowego. **[The density and compression and static bending strengths of Polish Beech.]** *Sylwan* 101 (9), 1957 (85–103). 6 refs. [Pol.]

Results of tests on material from 7 areas of Poland are given in graphs and tables.

959. **Physical properties of western hardwoods compared to eastern species.** *Pacific Coast Hardwoods, Seattle* Jan., 1957 (6). P.R.

Compares the specific gravity, weight, shrinkage, impact and static bending strength, and hardness, of 10 hardwoods from the west and 9 from the east of the U.S.A.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

960. KANTER, K. R. O teplovyh svojstvah drevesiny. **[The thermal properties of wood.]** *Derev. Prom.* 6 (7), 1957 (17–8). [Russ.] P.R.

Using data from heat measurements of Birch blocks 100 × 100 × 10 mm., a nomogram was constructed for determining the coefficients of thermal conductivity and diffusivity of Birch. (Similar work has been done in the U.S.S.R. for Oak, Scots Pine, and Siberian Larch.) Conclusions reached from the work are that the specific heat of wood does not depend upon species (varying only 3–4%); that thermal conductivity ∥ is greater than that ⊥; and that thermal conductivity is greater in the radial direction than in the tangential.

961. ČUDINOV, B. S. Grafičeskij rasčet skorosti nagreva drevesiny. **[Graphical calculation of the rate of temperature rise in heated wood.]** *Derev. Prom.* 6 (4), 1957 (11–3). 1 ref. [Russ.] P.R.

The rate of change of the temperature field in the wood to be heated was found to be proportional to the diffusivity of the wood and to the temperature gradient, and inversely proportional to the square of the dimensions of the heated object. Nomograms are presented for calculating the rate of heat penetration into small logs and bolts, and into parcels of timber or wide boards, two examples of their use being given.

962. OGARKOVA, T. V. Vlijanie stepeni pressovanija na koefficient linejnogo rasširenija drevesiny berezy. **[Influence of the degree of compression on the coefficient of linear expansion of Birch wood.]** *Derev. Prom.* 6 (9), 1957 (17–8). 2 refs. [Russ.russ.] P.R.

Continued experiments [cf. *F.A.* 18 No. 2084] have shown the coefficient of linear expansion (c.l.e.) of natural (uncompressed) wood to depend linearly on the % of late wood. The c.l.e. of compressed wood depends on the c.l.e. of the wood before compression, and also shows a linear dependence on the degree of compression.

963. CROSS, D., and LOFTUS, J. J. **Flame spread properties of building finish materials.** *Bull. Amer. Soc. Test. Mater.* No. 230, 1958 (56–60). 2 refs. P.R.

Describes tests by the radiant panel method of a variety of materials—wallpaper, paints, plastics, aluminium tiles etc.—on a plywood, fibreboard, or gypsum-board base, and the effect of the base on the flame-spread index of the assembly.

964. DAVIDSON, R. W. **The effect of temperature on the electrical resistance of wood.** *For. Prod. J.* 8 (5), 1958 (160–4). 9 refs.

Describes tests with Douglas Fir, Yellow Poplar [*Liriodendron tulipifera*] and Sugar Maple at 12 to 18% m.c., which largely confirmed earlier findings. At constant m.c., the logarithm of resistance varied linearly with the reciprocal of absolute temperature. Activation energy [i.e. the energy required to release bound ions to enable them to conduct electric current] increased exponentially with decreasing m.c. Differences between species were small.

965. ENČEV, E. A. Izmenenie na elektroprovodnostta pri uveličavane na vlažnostta na dărvesinata văv vrăzka s točkata na nasištane na vlaknata. **[The change in the electrical conductivity of wood with an increase in its moisture content, in connexion with the fibre-saturation point.]** *Nauč. Trud. lesoteh. Inst., Sofia* No. 5, 1957 (185–94). 9 refs. [Bulg.russ.]

Examines the relation between the electrical conductivity of wood and its m.c. for 9 softwoods and hardwoods each of different fibre saturation point, and also the accuracy of the Siemens and Halske, Karl Weiss, and Saturn electrical resistance moisture meters.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 964–5, 983, 986, 1123–4, 1140–2.

966. **Effect of gamma rays on the hygroscopicity of wood.** *Rep. For. Prod. Res. Bd., Lond. 1957*, 1958 (46).

Sitka Spruce specimens were exposed to γ-rays from Co^{60} to dosage levels of 1, 10 and 100 million rad., and the equilibrium m.c. curves then determined. Very heavy doses of radiation are needed to affect hygroscopicity (and possibly other physical properties), and the effect is negligible below 10 million rad.

967. KAJANNE, P., and HOLLMING, A. **On moisture determination in wood chips using gamma ray scattering.** *Pap. ja Puu* 40 (4*a*), 1958 (153–7). 4 refs. [E.e.fi.] P.R.

Describes the method, which is based on the Compton effect and has proved to give sufficiently accurate results.

968. TENDLER, M. M. Distancionnyj vlagomer. **[A remote-action moisture meter.]** *Derev. Prom.* 6 (8), 1957 (17). [Russ.] P.R.

Describes a prototype moisture meter, which is installed inside the kiln and transmits the changes in weight of wood samples as changes in electrical current, via a solenoid, to a milliammeter outside the kiln, which indicates the m.c. %.

969. ATANASOVA, M., and ŠANOVA, P. Aparat za opredeljane vlažnostta na dărvesinata. **[Apparatus for determining the moisture content of wood.]** *Nauč. Trud. lesoteh. Inst., Sofia* No. 5, 1957 (209–16). 7 refs. [Bulg.russ.]

Details are given of the design and performance of an electric-capacity moisture meter for wood, of a design similar to that of a soil moisture meter constructed by M. Borisòv and S. Kănev. Intended mainly for measuring m.c.'s above the fibre-saturation point, it had an accuracy of 0·5 to 2% when tested with Beech of 4·4–30% m.c., and Spruce of 8–40% m.c.

970. KISHEN, J., and KUKRETI, D. P. **Electrodes for Bamboo moisture meter.** *Indian For.* 84 (6), 1958 (347–9 + 1 photo, 1 dgm.).

Describes, with photograph and scale plan, clamp-and-drill electrodes designed to overcome the difficulties encountered in the use of ordinary needle

electrodes on Bamboo, owing to the brittleness, small size etc. of the material.

971. MAKKAVEEVA, G. T. Uskorennyj metod opredelenija vlažnosti spičečnoj solomki i korobkov. **[A quick method of determining the moisture content of match sticks and match boxes.]** *Derev. Prom.* 6 (7), 1957 (18). [Russ.] P.R.

For measuring the m.c. of the pieces at various stages during manufacture, the use of infra-red lamps is recommended, these being much quicker than oven-drying.

972. NISKANEN, E. **A survey of some investigations concerning the drying problem of wood.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3660, 1958. pp. 22 + 3 gphs., 2 dgms. 16 refs. Transl. by N. King from *Pap. ja Puu* 39 (3), 1957 (99–108). Limited distribution.

Summarizes the theory and investigations (mainly European and American) on the movement of moisture in wood.

973. SUTHITHANI, S. **[Equilibrium moisture content of timber.]** *Vanasarn* 15 (4), 1957 (23–7). [Siam.*e*.]

A preliminary note tabulating in English (*a*) the equilibrium moisture content of timber [species not given but apparently mill-stock] against the mean temperature and relative humidity of each month and (*b*) the mean relative humidities at 3-hourly intervals, and their average value, for each month of 1955; both for Bangkok.

974. NAKATO, K. **[On the cause of anisotropic shrinkage and swelling of wood. VII. On the anisotropic shrinkage in transverse section of isolated springwood and summerwood. VIII. On the relationships between the microscopic structure and the anisotropic shrinkage in transverse section.]** *J. Jap. Wood Res. Soc.* 4 (3), 1958 (94–105). 23 refs. [Jap.e.] P.R.

Laminated test-pieces were used to determine the shrinkage of early- and late-wood samples of *Cryptomeria japonica*, *Abies firma*, and *Larix leptolepis*. Results are tabulated. Radial shrinkage of both early and late wood increased linearly with increasing basic density and the extrapolation of this linear relationship to zero density gave zero shrinkage. The relationship between tangential shrinkage and density was curvilinear. The degree of anisotropic shrinkage in transverse section (t.s.), the ratio of tangential to radial shrinkage of isolated early and late wood, decreased curvilinearly with increasing density. Results of measuring average dimensions of tangential and radial walls of tracheids and the average width and interval of wood rays in t.s. are tabulated; and the relationship between shrinkage and the volumetric proportion of tangential and radial cell-walls of isolated early and late wood is shown in graphs for *Cryptomeria japonica*, *Abies firma* and *Larix leptolepis*.

975. MARIAUX, A. Le retrait du bois et ses constituants chimiques: recherche de corrélations. **[Shrinkage of wood and its chemical constituents: a study of correlations.]** *Repr.* from *Holzforschung, Berlin* 12 (2), 1958 (51–7). 4 refs. [F.f.g.]

No correlation was found between tangential shrinkage (*T*) and the chemical constituents of wood, in 140 samples of different species and provenances. Significant, fairly strong, correlations were found between *T* and density at 12% humidity (*d*), between *T*/*d* and cellulose content (positive), and between *T*/*d* and the logarithm of the content of alcohol/benzene extractives (negative); but none between *T*/*d* and contents of lignin, pentosan and boiling-water extractives.

976. TARKOW, H., and TURNER, H. D. **The swelling pressure of wood.** *For. Prod. J.* 8 (7), 1958 (193–6). 1 ref.

Describes experiments in measuring transverse swelling stress in cylindrical samples made of laminated Yellow Birch pressed to varying increased densities. The stress developing when relative humidity was raised from 30 to 100% increased rapidly with increasing specific gravity. For a specimen with sp. gr. 1·44 (i.e. a void volume of ca. 4%) and m.c. 4·6% at 30% r.h., it reached 11,000 lb./sq. in. after ca. 3 months, a value believed to be fairly close to the 'true' swelling pressure of wood, i.e. that of pure wood substance.

977. UGOLEV, B. N. Analiz naprjažennogo sostojanija drevesiny v processe suški. **[An analysis of the tension stresses in wood on drying.]** *Derev. Prom.* 6 (4; 5), 1957 (8–11; 10–2). 9 refs. [Russ.] P.R.

Presents detailed mathematical investigations on the tension stresses set up during drying, and on the determination of the functional relationship of tension to the amount and distribution of moisture in the wood.

978. HUBER, B., and MERZ, W. Über die Bedeutung des Hoftüpfelverschlusses für die axiale Wasserleitfähigkeit von Nadelhölzern. I. Mitteilung. Grunderscheinungen. **[The significance of the closure of bordered pits in the water-conductivity of softwoods. Part I. Basic phenomena.]** *Planta* 51 (5), 1958 (645–59). 47 refs. [G.g.] O.B.D.

The axial conductivity of conifers was tested on saturated specimens (15 × 40 × 40 mm.) at pressures up to 1 atm. (= 25 atm./m.) At pressures > ca. 0·5 atm./m. the conductivity drops with time, following progressive closure of the bordered pits, until an equilibrium at 1–2% of the original value is obtained. When the direction of the flow is reversed, conductivity rises suddenly to a maximum, according to the degree of one-sided closure already obtained in the bordered pits, and sinks with the redisposition of the tori on the opposite side, to the same final value as before. Displacement of the torus is hastened by high pressures and does not take place at the pressure of natural sap-flow (ca. 0·1 atm./m.).

979. HUBER, B., and MERZ, W. Über die Bedeutung des Hoftüpfelverschlusses für die axiale Wasserleitfähigkeit von Nadelhölzern. II. Mitteilung. Vergleichende Untersuchungen und praktische Anwendungen. **[The significance of the closure of**

bordered pits in the water-conductivity of softwoods. Part II. Comparative investigations and practical applications.] *Planta* 51 (5), 1958 (660–72). 43 refs. [G.g.] O.B.D.

[Cf. preceding abstract.] Further investigations were made on the rôle of bordered pits in the conductivity of water through wood, comparing heartwood and sapwood, early and late wood, softwoods and hardwoods. In coniferous woods the effects noted in Part I (i.e. drop in conductivity following the closure of bordered pits, and results of a reversal of the flow) were more marked in early than in late wood. They are also found in the heartwood despite a lower rate of conductivity. They are entirely absent in hardwoods, where the bordered pits have no tori. They are reduced by treatment of the specimens with alcohol or a wetting agent. $HgCl_2$ at concentrations of 10^{-3} to 10^{-4} fixes the pit-closing membranes and prevents all blocking effects.

980. ELLWOOD, E. L. **Project P.7. Preservation processes. Sub-project P.7–8. Factors governing the penetration and absorption of liquids in woods. Progress Report No. 1. Longitudinal flow through Eucalypt vessels and sapwood.** Division of Forest Products, C.S.I.R.O., Melbourne. 1958. pp. 11 + 1 tbl., 2 dgms.

The volume rate of flow of distilled, filtered, and de-gassed water through single vessels of green *Eucalyptus regnans* conforms generally with that predicted by the Poiseuille equation in the initial stages of flow. With sapwood vessels there was some indication that the rate of flow may fall slightly after some hours at a reasonably steady rate, but with a heartwood vessel flow ceased after one hour, probably owing to blockage of the vessel by movement of included substances in the wood. The rate of longitudinal flow through the entire cross-section of sapwood diminished continuously with time of flow. A regression equation is given for this relationship. *Author's summary.*

981. SMITH, D., and LEE, E. **The longitudinal permeability of some hardwoods and softwoods.** *Spec. Rep. For. Prod. Res., Lond.* No. 13, 1958. pp. 13. 7 refs.

Longitudinal permeability to air of ca. 100 species was determined. The average longitudinal permeability, k_a expressed in c.c./sec. sq. cm. atm./cm., and the ratios between maximum and minimum values for each species are tabulated. Values of k_a range from $< 0{\cdot}001$ to nearly 5000 for hardwoods and to 440 for softwoods. There is evidence that the permeability of hardwoods in the upper part of the range, which in general are those with vessels free from tyloses or gum deposits, depends solely on the size and number of their vessels. With the more permeable hardwoods it was shown that the permeability calculated from gas flow (N) was the same as that derived from the flow of non-polar liquids (toluene). With softwoods, however, it is greater, since the diameter of the flow channels is comparable to the mean free path of the gas, and in these conditions the flow of the gas is markedly increased by slip at the capillary wall. At atmospheric pressure the mean free path of N is about $0{\cdot}1\ \mu$; the average radii of the pores in *Mitragyna* spp. ($58\ \mu$) and in Beech ($30\ \mu$) and of tracheids in *Abies alba* and *A. grandis* ($20\ \mu$) are all too large to cause appreciable slip, but the width of the flow channels in bordered pits of softwoods would be only $2\ \mu$, small enough to cause considerable slip. Recent research on bordered pits [see *F.A.* 15 No. 1735] suggests that their construction is such that the flow channels would range from 0 to $2\ \mu$; this is confirmed by the values calculated for the openings in the present study from the ratio of N to toluene permeability, $1{\cdot}1$ and $0{\cdot}3\ \mu$, for *A. alba* and *A. grandis* respectively.

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 275, 943, 975, 994, 1151.

982. OLLINMAA, P. J. Puun tilavuuspainon määrittämisestä veteenupotusmenetelmää käyttäen. **[Determining the density of wood by submerging it in water.]** *Pap. ja Puu* 39 (11), 1957 (531–4). 5 refs. [Fi.fi.e] P.R.

An appraisal of the reliability of 4 variants, using 237 test pieces of normal and 269 of tension wood of Birch.

983. **Waterlogging of wood.** *Rep. For. Prod. Res. Bd., Lond. 1957*, 1958 (43–5).

Derives from continued experiments the generalized equation

$$R = \frac{1}{(m + 0{\cdot}667)}$$

for determining basic density (R) by measuring the maximum moisture content (m), thus rendering volume measurements unnecessary and facilitating density determinations on irregularly shaped specimens. The period required for maximum absorption was also studied on the 27 species involved; most required only a few days. [Cf. *F.A.* 17 No. 3225.]

984. **A new method of determining the density of wood samples.** *Rep. For. Prod. Res. Bd., Lond. 1957*, 1958 (8).

Density determinations on numerous small samples being time-consuming, the possibility of using isotope radiation absorption as a means of measuring density has been examined. Preliminary tests, with a specially designed β-radiation source of high intensity, have yielded promising results. The method is sensitive, and automatic recording of density variations within the individual growth rings of an increment core is considered practicable. A much larger number of trees can thereby be sampled as compared with traditional methods.

985. ŽITKOV, P. N. Opredelenie ob″emnogo vesa pressovannoj drevesiny metodom mečenyh atomov. **[Determining the density of compressed wood by the use of tracer atoms.]** *Derev. Prom.* 7 (3), 1958 (16–7). [Russ.] P.R.

Sample pieces ($5 \times 6 \times 0{\cdot}3$ cm.) of Scots Pine, Birch and Aspen wood, both natural and given various degrees of contour-compression, were saturated in oil containing radio-active P^{32} for 12 hours, and their radio-activity then measured by a Geiger counter. Measurements of the density of the

samples were made by a stereometric method and these results, when compared with those of the number of pulses/min. emitted, showed the changes in radio-activity to be a constant measure of the changes in density. In another investigation, cylindrical samples (diam. 25 mm., height 3 mm.) of Scots Pine wood given compression treatment were treated similarly, and the pulses/min. measured both at the centre and radially at 5, 10, 15 and 20 mm. from it. Results showed that the density was not uniform, that the centre of the wood was not compressed, and that the greatest degree of compression was in the outer, peripheral layers. Again, the regularity of the change in the density and in the number of pulses emitted was demonstrated.

986. TSOUMIS, G. T. Auxēsis, eidikon baros kai riknōsis tou xylou tēs maurēs peukēs, oxyas, apodiskou dryos kai kastaneas. [**Growth, specific gravity and shrinkage of the wood of *Pinus nigra*, *Fagus sylvatica*, *Quercus sessiliflora* and *Castanea sativa***.] Hē Geōponikē kai Dasologikē Scholē tou Panepistēmiou Thessalonikēs. 1958. pp. 31. 32 refs. [Gk.e.*e.*]

Gives data based on 2–3 trees of each species, on the variations of density with vertical and horizontal position in the tree and with ring width, and of volume shrinkage with density.

987. KANO, T. [**Forest biological studies on wood quality. (Report 14.) On the dimension of bulk-density of wood and its distribution in the stem of Todo-Fir [*Abies mayriana*].**] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 101, 1957 (1–99). 45 refs. [Jap.jap.e.*e.*]

From discs taken at 2-m. intervals from 68 sample trees, clear-felled from 0·4 ha., a total of 10,313 test pieces (5–10 rings in each) were cut from the N., S., E., and W. radii. Of these pieces, 8085 were normal, the rest compression wood. The % frequencies (class intervals in brackets) of bulk density (40 kg./cu.m.), ring breadth (0·5 mm.), late wood % (5), are discussed for normal and compression wood; upper-, middle- and lower-storey trees; stemwood in crown, clear bole and at the base; compass side of the tree; for trees with various height/diameter ratios, growing on two aspects etc. The relation between bulk density, ring breadth and late-wood % are shown with the third variable confined to class-interval groups. Stem-analysis diagrams show the distribution of bulk density in each of the 68 sample trees. There are 37 graphs, 23 tables and an 8-page English summary of general conclusions.

988. JAYNE, B. A. **Effect of site and spacing on the specific gravity of wood of plantation-grown Red Pine.** *Tappi* 41 (4), 1958 (162–6). 16 refs. P.R.

In view of conflicting notions concerning the effect of site and spacing on wood density, the author studied the interaction of both variables within a single geographic area where other environmental influences were negligible. Two areas of widely divergent site characteristics were selected, each planted with *Pinus resinosa*, now ca. 35 years old, at 4 × 4, 6 × 6, and 8 × 8 ft. In site (*a*) moisture and nutrient supplies were good, in site (*b*) poor. Three stems were selected from stands of each of the three spacings on both sites, and disks taken at 4-ft. intervals along the stem, from which oven-dry densities were computed to an accuracy of 0·001. Results showed that trees on site (*b*) produced wood of significantly higher density and with a higher % of late wood than those on (*a*), but on neither site did spacing significantly affect wood density. On site (*a*) spacings of 4 × 4, 6 × 6 and 8 × 8 ft. had produced respectively 12,300, 10,300 and 9000 cu. ft./ acre as compared with 3300, 2300 and 2200 on site (*b*). Measurements of volume growth, taken over the life of these stands, indicate that the annual production of wood per acre for the three spacings is approaching uniformity in the stands on each site, whereas the total volume produced on the two sites is diverging each year. The author considers it probable that the initial high production of wood in the stands with close spacing can be attributed to more efficient utilization of the site.

989. PERRY, T. O., and WU, W. C. **Variations in the specific gravity of Slash Pinewood and its genetic and silvicultural implications.** *Tappi* 41 (4), 1958 (178–80). 10 refs. P.R.

Gives results of basic density (b.d.) determinations from increment cores taken at breast height from thousands of trees throughout the range of *Pinus elliotii*. Core wood was removed to eliminate the bias resulting from the correlation between wood density and age. The density of *P. elliottii* wood, determined from an increment core taken at breast height, is usually 10% higher than that of wood from the entire tree. No significant difference was found between b.d. of trees of average growth rate and that of trees growing 2·5 times as fast. An alignment chart is presented which permits tree selection for dry pulp yield, based on considerations of both volume and sp. gr. The possibilities of controlling density and other pulping characteristics of Slash Pine through environmental and genetic manipulation are also reviewed.

990. ZOBEL, B. J., and MCELWEE, R. L. **Natural variation in wood specific gravity of Loblolly Pine, and an analysis of contributing factors.** *Tappi* 41 (4), 1958 (158–61). 16 refs. P.R.

A critical examination of the value of young thinnings, tops from logging, veneer cores and lowered rotation ages from a fibre-yield standpoint. Estimates of the % of total volume consisting of juvenile wood are given for trees of various ages from Virginia and Georgia. Analyses of some 2000 trees from several sites in 6 states showed the juvenile wood at b.h. to average 0·45 in sp. gr., compared with 0·54 for mature wood, and a regional trend for the latter, which falls from E. to W. [cf. *F.A.* 19 No. 2330]. The authors confirmed that there is little relationship between growth rate and sp. gr. for wood of the same age.

812.7. Strength Properties

See also Nos. 1058–60, 1063, 1094, 1151.

991. TACK, C. H. **The strength properties of some Uganda timbers.** *Bull. For. Dep. Uganda* No. 5, 1958. pp. 23. 3 refs.

Tabulates the strength properties of 57 species

and in 18 histograms compares these properties with Podo, Iroko and European Ash, each at 12% m.c. and each taken to equal 100, the Podo for timbers ⩽ 40 lb./cu. ft., Iroko for timbers > 40, and the Ash for toughness and impact strength in both weight classes. A guide to the strength properties required for 78 uses is appended.

992. SCHNIEWIND, A. P. **The strength and related properties of California Black Oak [*Quercus kelloggii*]. I. General description and strength properties in the green condition.** *Calif. For. & For. Prod. Calif. For. Prod. Lab.* No. 6, 1958. pp. 4. 10 refs.

With tabulated results of tests.

993. **Long-term loading.** *Rep. For. Prod. Res. Bd., Lond. 1957*, 1958 (14).

Long-term experiments on 2 × 2-in. Baltic Redwood (*Pinus sylvestris*) and Douglas Fir beams have been continued [cf. *F.A.* 18 No. 911; 19 No. 2295]. After 3 years under load, some test specimens were unloaded and, after conditioning, tested to destruction. They showed no loss of strength compared with the controls, but an increase in deflection, over the initial deflection under load, of ca. 95 and 60% respectively, was recorded. The specimens of both species loaded for 1 year and 3 years had, on removal of load, a permanent set, amounting approximately to the creep that had taken place over the duration of loading. All recovered ca. one-half of their respective permanent sets during conditioning. An extension to the project has been started to study creep and the ultimate long-term strength under different loads.

994. **Structural use of timber.** *Rep. For. Prod. Res. Bd., Lond. 1957*, 1958 (13).

Grading and testing of consignments of Douglas Fir structural timbers from Gwydyr (N. Wales) and the Forest of Dean, and of Scots Pine from Farnborough (S. England) and Banchory (Scotland) have been completed. The Douglas Fir joists were all similar in density and strength properties, but the older Douglas from the Dean was ca. 10% denser than the younger Gwydyr material. The Scots Pine joists from Banchory, although of lower density, were ca. 20% stronger in static bending than those from Farnborough, probably because of the relatively large knot clusters in the latter.

995. ČERNECOV, M. M. Issledovanie pročnosti drevesiny pri rastjaženii poperek volokon. **[Investigation of the resistance of wood to tension perpendicular to the grain.]** *Derev. Prom.* 6 (3), 1957 (17–8). [Russ.russ.] P.R.

Tabulates the results of tests showing the resistance of wood samples of 24 tree species (at 15% m.c.) to tension radial (t.r.) and tangential (t.t.) to the grain. The resistance to t.r. is 1·3–1·8 times that to t.t., depending on species. With Scots Pine, Oak and Beech, measurements of resistance made at angles of 0°, 15°, 30° . . . 90° to the annual ring, showed for all the species an almost linear increase in strength from 0° to 90°. The influence of temperature (20°, 40° and 80° C.) on the resistance of Scots Pine, Oak and Birch to t.r. and t.t. was examined at different wood m.c.'s. The resistance to tension ⊥ decreases with increasing temperature at any m.c. of the wood. With Spruce, Oak, Beech and Birch, the modulus of elasticity (m.e.) was determined at angles of 0°, 15°, 30° . . . 90° between the annual ring and the direction of tension. The minimum m.e. was reached at ca. 35–45° and the maximum at 90° (i.e. t.r.) with all 4 species.

812.8. Workability. Working Properties

996. DAVIS, E. M. **Development of methods for evaluating the machining qualities of wood and wood-base materials.** *Rep. U.S. For. Prod. Lab., Madison* No. 2108, 1958. pp. 26 + 13 photos, 6 dgms. 18 refs. P.R.

Presents, in specification form, the methods that have been developed for testing machining characteristics of timber, fibreboards, chipboards, plywood etc. (planing, shaping, turning, mortising, boring and sanding) with illustrations of some of the apparatus employed.

997. FLAMWELL, C. T. **The woodworking properties of *Diospyros* [formerly *Maba*] *abyssinica*.** *Tech. Note Util. Div. For. Dep. Tanganyika* No. 11, 1958. pp. 3.

Makes detailed recommendations, based on standard tests, for saw types and their h.p. requirements (circular, rip, cross-cut, band) and for operating cutters (planing, spindle-moulding, routing and boring). The timber behaves generally satisfactorily under these operations and in mortising, handwork and nailing (difficult). Mills require an extractor to remove the dust which is irritant to eyes and nose.

813. Wood Chemistry

See also Nos. 95, 739, 975, 1025, 1204 *et seq.*

998. **Problems in wood chemistry: proceedings of the seventh session, United Nations Food and Agriculture Organization Technical Panel on Wood Chemistry, April 8–13, 1956, Jerusalem, Haifa, Israel.** The Weizmann Science Press of Israel, Jerusalem. 1957. pp. 136. Many refs.

Includes the following papers: Radiation chemistry and wood (*H.Mark*) [cf. *F.A.* 19 No. 1169]; Chemistry, morphology and mechanical properties of the compound middle lamella (*H. W. Giertz*); The middle lamella of the bast fibres (*M. Lewin*); The problem of carbohydrate lignin bonding in wood (*K. Freudenberg*); Expanding wood utilization through the use of resin (*E. C. Jahn*); A few principles of adhesion (*H. Mark*); New developments in synthetic resin for wood adhesives (*E. Ott* and *C. A. Heiberger*); and Review of recent literature on synthetic adhesives compiled by the Patent Department of the Food Machinery and Chemical Corporation, New York [120 abstracts from world literature and patents since 1945].

999. BRUUN, H. H. Institutet för träkemi vid Åbo Akademi: verksamheten åren 1955–57. **[Report no the activity of the Institute for Wood Chemistry, Åbo Akademi, 1955–57.]** *Pap. ja Puu* 40 (4*a*), 1958 (137–40). [Sw.sw.fi.e.] P.R.

Subjects covered include the chemistry of bark of

Alnus glutinosa and sulphate pulping of Aspen, *A. incana* and *A. glutinosa*.

1000. BROWNING, B. L. **Chemical characterization of wood samples for the forest geneticist.** *Tappi* 41 (4), 1958 (156–7). 4 refs. P.R.

Deals with the problem of selecting wood constituents of most significance to the geneticist and the limitations of sampling and analytical method.

1001. PEEL, J. D., and BHASKARAN, T. A. **The chemical compositions and fibre dimensions of common Malayan timber species.** *Res. Pamphl. For. Res. Inst., Kepong* No. 22, 1957. pp. 14. 33 refs.

Tabulates the results of chemical analysis and fibre dimensions for 30 Malayan species (mostly Dipterocarps) with similar data for *Eucalyptus regnans*, *Picea abies* and *Pinus sylvestris* by way of comparison. The results are discussed with reference to the commercial value of the timbers.

813.1. Chief Organic Constituents. Constituents of the Cell Wall

See also Nos. 1159–60.

1002. SCHUERCH, C. **The separation and properties of hemicellulose, cellulose and hydrogenated lignin from sawdust.** *For. Prod. J.* 8 (5), 1958 (150–3). 6 refs.

Describes results of experimental extractions of hemicelluloses from hardwood meal by a brief treatment with diluted NaOH. It is suggested that by combining the process with ordinary soda pulping (requiring less alkali because of the previous removal of soluble carbohydrates) and simultaneous catalytic hydrogenation to isolate the lignins, ca. 75% of the wood could be recovered as 3 major fractions.

1003. GROHN, H., and SCHIERBAUM, F. Enzymatische Abbauversuche an schwinggemahlenem Holz und Zellstoff. **[Studies on enzymatic decomposition of wood ground in a vibratory ball mill, and of cellulose.]** *Holzforschung, Berlin* 12 (3), 1958 (65–73). 24 refs. [G.g.e.] P.R.

Treatment of Spruce and Poplar in a vibratory ball mill gave a water-soluble fraction of ca. 34%; reduced the cellulose content by 42–44% and doubled that of polyoses, while that of lignin remained constant. The soluble and the insoluble fractions were each exposed to degradation by a culture filtrate, containing enzymes, of *Aspergillus oryzae*. The degradation of the soluble fraction was nearly complete after 24 hours but the increase in reducing power (measured by the reaction with NaOI) was slower, reaching its maximum 2–5 days after the beginning of the experiment. Action of the enzymes on the insoluble fraction degraded 20% of the original substance, chiefly in the polyoses, less intensively in the cellulosic carbohydrates and least in the lignin. When the wood is treated in the ball mill, extracted with cold water immediately and then exposed to enzyme action, up to 54% of the original wood substance will be degraded.

1004. GIERER, J. Über die Isolierung, Struktur und Biosynthese des Lignins. **[The isolation, structure and biosynthesis of lignin.]** *Holz Roh- u. Werkstoff* 16 (7), 1958 (251–62). 106 refs. [G.e.] P.R.

Describes various methods of isolating lignin, with special emphasis on those using milder conditions, and gives the analytical composition of Björkman lignin, obtained by grinding wood powder in a non-swelling solvent and extracting the lignin with dioxane. Discusses research on lignin structure in two parts, one dealing with the determination of the substituents on the aromatic nuclei after oxidative and reductive degradations, the other with the structural features of the three C atoms in the side chains. Outlines the probable pathway of biosynthesis, describing the stages resulting in the transformation of carbohydrates into molecules with a phenyl-propane skeleton, and the laboratory transformation of the latter into an artificial lignin by enzymatic oxidation, and polymerization reactions. *From author's summary.*

1005. HATA, K., and SOGO, M. **Chemical studies on the bark. IV. Comparison of lignin between the bark of gymnosperm trees and that of dicotyledonous trees.** *J. Jap. Wood Res. Soc.* 4 (3), 1958 (85–90). 9 refs. [E.e.jap.] P.R.

The inner and outer bark of 4 species of (*a*) conifers (*Pinus densiflora*, *Chamaecyparis obtusa*, *Cryptomeria japonica* and *Ginkgo biloba*) and (*b*) hardwoods (*Salix bakko*, *Prunus donarium* var. *spontanea*, *Cinnamomum camphora*, and *Melia azedarach* var. *japonica*) were extracted with alcohol/benzene (1/1) for 12 hr. and then with hot water for 24 hr. and finally subjected to the Mäule test. Fibrous tissues of barks of (*a*) produced a purple colour, and those of (*b*) a weak yellow-brown colour. These samples were then oxidized with alkaline nitrobenzene, and the oxidation products examined by paper chromatography to determine the presence of syringic acid, protocatechualdehyde, vanillic acid, 5-formyl vanillic acid, *p*-hydroxybenzaldehyde, syringaldehyde, vanillin, acetoguaiacone and *p*-hydroxybenzene. It was found that inner and outer bark lignins of (*a*) contained guaiacyl, *p*-hydroxyphenyl and 3,4-dihydroxyphenyl types of structural units and a very small amount of syringyl-type units, whereas those of (*b*) had syringyl, guaiacyl, *p*-hydroxyphenyl and 3,4-dihydroxyphenyl types of structural units.

1006. HOLMBERG, B. Fichtenlignine und Thioglykolsäure. (Ligninuntersuchungen XX). **[Spruce lignin and thioglycolic acid. (Lignin studies XX).]** *Arkiv för Kemi, Stockholm* 12 (1), 1958 (41–61). 11 refs. [G.] O.R.S.

1007. ZOBEL, B. J., and MCELWEE, R. L. **Variations of cellulose in Loblolly Pine.** *Tappi* 41 (4), 1958 (167–70). P.R.

Preliminary results of a study, based on samples from 125 trees from five separate areas, designed to determine cellulose variations by trees, site, and geographical regions. A rapid method of analysis was developed making it possible to use small samples, with which two types of cellulose were determined, viz. water-resistant carbohydrate (WRC) and α-cellulose. The authors found that for any set of samples the WRC content was always highly correlated (17% level) with the α-cellulose content,

and that a high correlation also existed between the cellulose content of juvenile and of mature wood.

1008. LINDGREN, P.-H. **X-ray orientation investigations on some Swedish cellulose materials.** *Arkiv för Kemi, Stockholm* 12 (5), 1958 (437–52). 26 refs. [E.e.] O.R.S.

The materials examined were samples of Spruce from Uppland and Norrland, and of wheat straw. From microphotometer recordings of the X-ray fibre diagrams obtained, two different orientation parameters were calculated: (1) the orientation angle (the width, at half the maximum height, of the main peak of the microphotometer curve), (2) the orientation quotient (calculated from the upper part of the area under the microphotometer curve, i.e. that part lying above the boundary line linking the minimum points of the curve, in relation to the total area). Values of (1) and (2) along one radius were graphically correlated with each other and with annual ring width; there appeared to be a relation between (2) and annual ring width and between (1) and (2). The general impression from the X-ray diagrams was that late wood usually gave sharper diagrams, indicating a higher degree of crystalline order than the corresponding early wood. The diagrams of compression wood and of the innermost (up to the tenth) annual rings of normal wood showed spiral orientation.

1009. GLAUDEMANS, C. P. J., and TIMELL, T. E. **The polysaccharides of White Birch (*Betula papyrifera*). IV. The constitution of the hemicellulose.** *J. Amer. chem. Soc.* 80 (5), 1958 (1209–13). 34 refs. O.R.S. [Cf. *F.A.* 19 No. 3436.]

1010. ORCEL, M. Étude sur les polyholosides des tissus ligneux de quelques angiospermes à bois archaïque. [**A study of the mannose and pentosan of the woody tissues of some angiosperms with archaic wood.**] *C.R. Acad. Sci., Paris* 246 (15), 1958 (2288–90). 11 refs. [F.] O.R.S.

Tabulated results show that the pentosan and mannose contents of 23 species resembling gymnosperms in their anatomical characters, are similar to those of the typical angiosperms and quite unlike those of the gymnosperms.

1011. ORCEL, M. Études sur les polyholosides des bois de quelques Préphanérogames. [**A study of the mannose and pentosan of the wood of some pteridophytes and gymnosperms.**] *C.R. Acad. Sci., Paris* 246 (16), 1958 (2402–4). 4 refs. [F.f.] O.R.S.

Results of determinations of the mannose and pentosan contents of (*a*) 18 species of conifers, (*b*) 3 species of Filicales and (*c*) 4 species of Cycadaceae and *Ginkgo biloba*, are tabulated. The pentosan contents for all 3 groups were similar, with mean figures of 4·6, 3·7 and 4·9% respectively, but the mannose contents of (*c*) were much closer to (*b*) than to (*a*), with mean figures of 3·5, 4·6 and 10·6% respectively.

1012. ADAMS, G. A. **Structure of an arabogalactan from White Spruce (*Picea glauca* (Moench) Voss).** *Canad. J. Chem.* 36 (5), 1958 (755–62). 24 refs. O.R.S.

1013. CROON, I., and LINDBERG, B. **Studies on glucomannans from Norwegian Spruce. II. Structural investigations.** *Acta chem. scand.* 12 (3), 1958 (453–8). 16 refs. [E.e.] O.R.S. [Cf. *F.A.* 19 No. 2313.]

813.2. Minor Organic Constituents. Extractives. Cell Contents

See also Nos. 1024–5.

1014. HERGERT, H. L., and GOLDSCHMID, O. **Biogenesis of heartwood and bark constituents.** *J. organ. Chem.* 23 (5), 1958 (700–4). 32 refs. O.R.S.

Douglas-Fir needles, cambium and sapwood were found to contain two new glucosides, the 3′-β-glucoside of taxifolin (3,3′,4,5,7-pentahydroxyflavanone) and the 3′-β-glucoside of quercetin (3,3′,4′,5,7-pentahydroxyflavone). Taxifolin glucoside was also found in the sapwood of *Cedrus atlantica*, needles and sapwood of *Larix occidentalis*, needles, inner bark and sapwood of Sitka Spruce, and in traces only in bark of *C. atlantica*, *L. occidentalis*, outer bark of Sitka Spruce and *Thuja plicata*, and needles of *Tsuga heterophylla* and *Abies amabilis*. All coniferous species examined that contained taxifolin in the heartwood or outer bark, also contained taxifolin glucoside. It is suggested that taxifolin is synthesized in the leaves, where it is present as the glucoside, and then transported to the heartwood and outer bark where it is found as the aglycone.

1015. BARTON, G. M., and GARDNER, J. A. F. **Determination of dihydroquercetin in Douglas Fir and Western Larch woods.** *Repr.* from *Analyt. Chem.* 30 (2), 1958 (279–81). 13 refs.

In a rapid colorimetric method, the flavanone in an aqueous extract of the wood is reduced with Zn and CH_3COOH under standardized conditions, and a reddish-purple colour is then produced by adding HCl. A leucoanthocyanin-like substance present in Douglas Fir, which produces a similar colour, is not extracted by hot water. Other 3-hydroxyflavanones that would give the same colour reaction do not occur in Douglas Fir and only as traces in Western Larch.

1016. ZAVARIN, E. **The extraneous substances of Incense Cedar (*Heyderius decurrens* Torrey).** *Calif. For. & For. Prod. Calif. For. Prod. Lab.* No. 5, 1958. pp. 5. 8 refs.

Apart from a relatively small amount of terpene, thymoquinone, tropolone, and carbohydrate material, the main amount of Incense Cedar [*Libocedrus decurrens*] extract is phenolic in nature. Ca. 23–24% of the total extract is composed of the rare monomeric phenols with *p*-cymene skeleton and of their dimers formed through oxidative coupling, 70% consists of phlobaphene and tannin, and ca. 2·5% is the phenolic material, not yet characterized. The sapwood extract amounts to 3·4% (dry-weight basis). The average total extract from bark exceeds 20%. Ca. 8% of it is a material similar to tall oil in composition, ca. 8% is tannin, phlobaphene and the like, and the rest carbohydrates. The amount of tannin is too low for commercial extraction. The volatile oil from leaves and twigs

amounts to 0·21 to 0·27% and is terpenic in nature. *From author's summary.*

1017. GARDNER, J. A. F., and BARTON, G. M. **The extraneous components of Western Red Cedar [*Thuja plicata*].** *For. Prod. J.* 8 (6), 1958 (189–92). 20 refs.

The extraneous components, ranging from 5 to 25% of the weight of the wood, consist of the volatile components α-, β- and γ-thujaplicin, 7-hydroxy-4-isopropyltropolone, thujic acid, and methyl thujate, and the non-volatile components arabinose, an unidentified sterol, and several uncharacterized phenols. *From authors' summary.*

1018. MATSURA, S. **The structure of cryptostrobin and strobopinin, the flavanones from the heartwood of *Pinus strobus*.** *Pharmaceutical Bulletin, Tokyo* 5 (3), 1957 (195–8). 12 refs. [E.e.] O.R.S.

1019. ERDTMAN, H., and THOMAS, B. R. **The chemistry of the natural order Cupressales. XX. Heartwood constituents of the genus *Widdringtonia*.** *Acta chem. scand.* 12 (2), 1958 (267–73). 5 refs. [E.e.] O.R.S.

The 5 species *W. whytei*, *W. juniperoides*, *W. schwarzii*, *W. cupressoides*, and *W. dracomontana*, were studied. A series of new sesquiterpenoid compounds isolated included the hydrocarbon widdrene, the alcohol widdrol, two sesquiterpene alcohols containing 2 oxygen atoms and a series of acids. Cedrol was present in all except *W. cupressoides*, and eudesmol in *W. cupressoides* and *W. dracomontana*.

1020. PERILÄ, O., and TOIVONEN, A. **Investigations concerning the seasonal fluctuations in the composition of the diethyl-ether extract of Birch (*Betula verrucosa*).** *Pap. ja Puu* 40 (4*a*), 1958 (207–13). 6 refs. [E.e.fi.] P.R.

The ether extracts of 6 Birches (*Betula verrucosa*) felled at 2-monthly intervals were determined and analysed. The total amount of ether extract was highest in May, and lowest in September, November and January. The content of unsaponifiable matter in the extract was highest in September, November and January, and lowest in March; the acid content in the extract was highest in March and May, and lowest in November. Further data on the acid fractions are given.

1021. GOTTLIEB, O. R., and MORS, W. B. **The chemistry of Rosewood. II. Isolation and identification of cotoin and pinocembrin.** *J. Amer. chem. Soc.* 80 (9), 1958 (2263–5). 10 refs. O.R.S.

Cotoin (previously found only in *Aniba coto*) was isolated from *A. duckei*, and pinocembrin (previously found in the angiosperms only in Cherry wood) from *A. rosaeodora*. [Cf. *F.A.* 19 No. 2324.]

1022. GOTTLIEB, O. R., and MAGALHAES, M. T. **Isolation of piperonylic acid from *Ocotea pretiosa*.** *Nature, Lond.* 182 (4637), 1958 (742–3). 4 refs.

Piperonylic acid, which is apparently rare in nature, was isolated from the benzene extractives of the wood of *O. pretiosa*.

1023. KONDO, T., ITO, H., and SUDA, M. **Wood extractives. V-VII.** *Journal of the Agricultural Chemical Society of Japan, Tokyo* 30, 1956 (281–3; 717–20); 32, 1958 (1–4). [Jap?] From *abstr.* in *Chem. Abstr.* 52 (14), 1958 (12395). P.R.

(V) Gallic acid (in a yield of ca. 0·5%) and ellagic acid were isolated from heartwood of *Platycarya strobilacea*, and glucose, xylose and rhamnose detected by paper chromatography. A black colour developing on the surface of plates from the wood was ascribed to the reaction of I and Fe from a sawing machine. (VI) Lignoceric acid, quercetin and *dl*-catechol were isolated from heartwood of *Machilus thunbergii*. Galactose, xylose, mannose, arabinose and rhamnose were found in the free state. (VII) *trans*-2,3′,4,5′-tetrahydroxystilbene (in a yield of 6 g./1 kg. wood), efflorescent colourless needles, m. [? melting range] 201–2·5°, and morin were obtained from heartwood of *Morus bombycis*; glucose, rhamnose, xylose, mannose and two oligosaccharides were detected by paper chromatography.

813.5. Reaction with Metals

See No. 1061.

813.6. Effect of Chemicals on Wood. Resistance to Chemical Attack

See Nos. 1062, 1109.

814. Natural Durability. Old Wood. Fossilized Wood

See also Nos. 1176–8.

1024. SANDERMANN, W., DIETRICHS, H. H., and GOTTWALD, H. Untersuchung frühgeschichtlicher Hölzer und deren Bedeutung für den Holzschutz. **[Investigation of old woods and their significance for wood preservation.]** *Holz Roh- u. Werkstoff* 16 (6), 1958 (197–204). 11 refs. [G.g.e.] P.R.

Timbers from Egyptian sarcophagi (*a*) 2600 and (*b*) ca. 1000 B.C. were identified as *Zizyphus* sp. (*a*) and *Cedrus* sp. (*b*). Two others from Maya buildings (*c*) Tikal, ca. 750, and (*d*) Chichen-Itza, 950–1350 A.D. as *Achras sapota* (*c*) and *Caesalpinia platyloba* or *Brasilettia violacea* (*d*). The Maya timbers and related species were also examined by paper chromatography and both the woods and their extractives subjected to comparative feeding tests with *Reticulitermes flavipes* which proved them to be highly toxic. [Cf. *F.A.* 19 No. 2402.]

1025. NARAYANAMURTI, D., *et al.* Untersuchungen an einer alten Holzprobe. **[Investigations on a specimen of old [Teak] wood.]** *Holz Roh- u. Werkstoff* 16 (7), 1958 (245–7). 5 refs. [G.g.e.] P.R.

Presents in photomicrographs, X-ray diagrams, and tables the results of examining the structure, physical properties, and chemical composition of Teak from a beam 1800 years old, from a Buddhist monastery in Kanheri. The microscopic structure was quite distinct. The cell-walls, especially of fibres, showed evidence of degradation. There was some fungus damage in the parenchyma cells. The lumen was filled with a gum-like secretion and

the extractive content was higher than in fresh Teak. Density and compressive strength were higher, and water absorption less.

1026. GHOSH, S. S., and LAL, K. **On Sal wood excavated from Mauryan pillared hall, Pataliputra.** *Curr. Sci.* 27 (4), 1958 (136–7). 8 refs. A.P.B.

Presents the results of an examination of timber identified as *Shorea robusta*. The wood is mature heartwood, having vessels completely blocked by tyloses, and is in a remarkable state of preservation.

1027. GHOSH, S. S., and KAZMI, M. H. ***Anisopteroxylon bengalensis* gen. et sp. nov.—new fossil wood from a microlithic site of West Bengal.** *Sci. & Cult.* 23 (9), 1958 (485–7). 12 refs. E.M.B.

Describes, with photographs of sections (× 15 and × 60), a wood from a 10,000-year-old site, with similarities to 6 existing Dipterocarp genera but nearest to *Anisoptera*.

815. Effect of Growth Factors on Structure and Properties

See also Nos. 943, 945, 947–52, 957, 986–90, 994, 1007, 1191, 1193.

1028. GHOSH, S. S., RAO, K. R., and PURKAYASTHA, S. K. **Variation in structure and quality of some Indian timbers in relation to growth.** *Indian For.* 84 (6), 1958 (341–4 + plate). 16 refs. (Seventh British Commonwealth Forestry Conference, 1957.)

Variations in structure and quality of some Indian hardwoods are discussed with special reference to rate of growth. Though much work has been done in India and other countries on non-porous and ring-porous woods, hardly any information is available on diffuse-porous woods. As Indian timbers mostly belong to this group, an attempt has been made in this paper to bring out some general trends observed at Dehra Dun, that may be of interest to workers in other tropical countries. The paper includes photomicrographs of fast- and slow-grown specimens of *Acacia catechu*, *Michelia champaca*, *Ceiba pentandra*, *Bombax malabaricum*, and *Pterocymbium tinctorium*.

82. Conversion, Shaping, Assembly and Finishing of Wood: General

1029. **[The German Industries Fair 1958.]** *Holz* 12 (4; 6), 1958 (39–46; 77–80). [G., E. or F.] P.R.

No. 4 contains a list of 46 new types of woodworking machines, saws, kilns, control instruments etc., with short descriptions in German and English, and 10 more detailed descriptions in German and French. No. 6 has a further 17 short descriptions in German and English or French, including a veneer drier with jet ventilation, dust collecting and air-conditioning equipment etc.

1030. Les machines à bois 1958. II.—Foire de Paris. **[Wood-working machines in 1958. II. The Paris Fair.]** *Rev. Bois Appl.* 13 (7/8), 1958 (25–30). [F.]

Illustrations, with notes, of some of the machinery on view at the Fair.

1031. ROŽKOV, D. S., and FEOKTISTOV, A. E. Opyt primenenija provoločnyh tenzometrov dlja opredelenija usilij rezanija. **[An experiment on the use of wire strain gauges to determine stresses in cutting.]** *Derev. Prom.* 6 (4), 1957 (16). [Russ.] P.R.

Describes the arrangement of the resistance-wire strain-gauges when band-sawing Pine, and the recording of cutting and feed stresses by an oscillograph.

1032. ALEKSEEV, A. V. Vlijanie élektričeskih javlenij, voznikajuščih pri rezanii drevesiny, na iznos instrumenta. **[The influence of electrical phenomena occurring during the cutting of wood, on the wear of the tool.]** *Derev. Prom.* 6 (8), 1957 (15–6). 4 refs. [Russ.] P.R.

Agrees with Kivimaa's conclusion [cf. *F.A.* 14 No. 3774] that, in cutting green wood, the amount of blade blunting caused by electrochemical corrosive processes can be reduced by a current of a definite polarity across the cutting gap, but considers too, that the blunting is also reduced by the decrease in cutting forces caused by the changes in conditions (i.e. greater heat) in the cutting zone, when working 'under potential'. In investigations on plane blade wear on dry wood [cf. *F.A.* 20 No. 1054], breakdowns were observed in the form of a chain of pits or grooves at the edge of the friction zone. This was not explicable by mechanical wear, and experiments on Pine and Birch showed that static electricity created during cutting caused electrical charges at the moment the blade lost contact with the wood. These charges are thought to increase the size of the pits and grooves, thus hastening the mechanical breakdown of the surface layers of metal, and increasing the wear on the back of the blade. This was confirmed by a trial under conditions of artificially increased humidity which precluded the possibility of the creation of static charges during cutting; total wear was 25% less than on blades working under normal conditions. The results clearly indicate the need to choose blades of steel able to resist not only mechanical wear but also chemical and electrical corrosion, and to differentiate between steels for use with wet and dry wood.

1033. PRUŠÁK, J. Tvrdé chromování dřevoobráběcích nastrojů. **[Hard chromium plating of woodworking instruments.]** *Drev. Výskum* 2 (2), 1957 (235–49 + 2 plates). 8 refs. [Cz.russ.g.e.] P.R.

The author's tests have shown that when the back of the knife is hard-chromium plated, durability is 8 times as great as in untreated blades. With this chromium plating and grinding of the cutting edge on the face, conditions are created for partial self-grinding at work, and stress on the chromium coat is lessened.

1034. REYNOLDS, R. V. **Status of tungsten carbide in the woodworking industry.** *For. Prod. J.* 8 (5), 1958 (24*A*–26*A*).

Presents tables of physical and mechanical properties as compared with steel, and discusses applications in machining high-density hardboard, scarfing operations, planing etc. Initial grinding difficulties are said to be largely overcome.

822. Saws and Sawing

See also Nos. 997, 1099, 1102–3.

1035. Hudin, K. S. Zavisimost' vyhoda kačestvennyh bukovyh pilomaterialov sposoba raskroja syr'ja. [**The dependence of the yield of quality sawn timber of Beech on the method of sawing the logs.**] *Lesn. Prom.* 1957 (8), (23–5). 1 ref. [Russ.]

Logs of Beech (3rd class; diam. 40–60 cm.) were sawn by different methods to obtain boards of set dimensions. The influence of red heart on the yield and quality of boards was also examined. The segment method of sawing [cf. *F.A.* 19 No. 3455] proved best.

1036. Vlasov, G. D. Sravnitel'nyj analiz proizvoditel'nosti pil'nyh stankov i potočnyh linij iz nih. [**Comparative analysis of saw performance, and of production lines of saws.**] *Derev. Prom.* 6 (12), 1957 (8–10). [Russ.] P.R.

Tabulates the technical characteristics, performance, and labour costs, of the types of saw commonly used in Europe, the U.S.S.R., and the U.S.A.

1037. Mügge, H. F. Entwicklung und Betriebspraxis der Vertikal-Gattersägemaschinen. [**Development and operation of vertical frame saws.**] *Holz Roh- u. Werkstoff* 15 (4), 1957 (153–9). 3 refs. [G.g.e.] P.R.

Discusses recent improvements in the construction of sashes to give increased speed of feed and/or thinner saw blades, the automatic regulation of the angle of hang in relation to intermittent, continuous, hydraulic and non-hydraulic feed systems, accident prevention etc. A small, high-speed design (without carriage) for short lengths of small section is briefly described.

1038. Beršadskij, A. L., and Moiseev, A. V. Regulirovanie natjaženija ramnyh pil. [**Regulating the tension of frame saws.**] *Derev. Prom.* 6 (3), 1957 (6–8). [Russ.] P.R.

Describes the 'Sigmometer', a device designed by A. V. Moiseev for regulating the tension of frame saws, and nomograms for determining the adjustments necessary. Examples of the use of the nomograms are given.

1039. Zaharova, E. I. Gidronatjažnye prisposoblenija dlja ramnyh pil. [**Hydraulic tensioning devices for frame saws.**] *Lesn. Prom.* 1957 (11), (22–4). [Russ.]

A review of some Soviet and E. German devices.

1040. Walters, E. O. **Merits of riderless vs. setter-operated [sawmill] carriages.** *For. Prod. J.* 8 (5), 1958 (36*A*–39*A*).

Analyses production data of 5 riderless and 5 setter-operated types of carriage. There was little difference in production or accuracy but riderless carriages reduced costs through saving of wages.

1041. Sergeev, E. E. Normirovanie rashoda ramnyh pil s pljuščenymi zub'jami. [**Limiting the consumption of blades used in swage-set frame saws.**] *Lesn. Prom.* 1957 (11), (21–2). 2 refs. [Russ.]

A special device was used to measure the wear and grinding losses of frame-saw blades swage-set (*a*) by hand, and (*b*) by machine, when sawing hardwoods. Wear was about the same for (*a*) and (*b*), but grinding losses were slightly less for (*b*) than for (*a*), because of the greater regularity of the machine swaging. Formulae are developed for the amount of width wear per spell of work (154 min. actual working time), and for the number of blades used per machine shift. It was also found that mechanical swaging after each spell of work reduced blade losses as compared with swaging after 2 or 3 spells.

1042. Razumov, N. T. O vybore točil'nogo kruga i optimal'nyh režimov zatočki ramnyh pil. [**Choice of grindstone and of optimum grinding régimes for frame saws.**] *Derev. Prom.* 6 (3), 1957 (12–4). [Russ.russ.] P.R.

Investigations have shown bakelite-base stones to be the best. The optimum thickness of metal to be removed is 0·05–0·06 mm., the optimum peripheral speed of the grindstone 27–30 m./sec., and the optimum longitudinal feed rate 6 m./min.

1043. Razumov, N. T. Zatočka ramnyh pil poristymi krugami na keramičeskoj svjazke. [**Sharpening frame saws with porous discs having a ceramic binder.**] *Derev. Prom.* 6 (10), 1957 (14). [Russ.] P.R.

Compares the ceramic-base discs (250 mm. diam., 10 mm. thick, composed of 44% granules, 34% pores, 22% binder) with (*a*) bakelite-, and (*b*) vulcanite-base discs. Their strength is sufficient to permit peripheral working speeds of 45–50 m./min. to be used; they remove less metal than (*a*); and they can do 7 times the specific work of (*a*) and thrice that of (*b*). In practical tests on their working life, one ceramic-base porous disc of hardness ST-1 (ÉB 46 ST 1 K 9) sharpened 480 saws 1650 mm. long and 2 mm. thick, and another ca. 500.

1044. Lapin, P. I. Ešče raz o prokovke kruglyh pil. [**More on the tensioning of circular saws.**] *Derev. Prom.* 6 (10), 1957 (11–3). 3 refs. [Russ.russ.] P.R.

A justification of the author's formula for evaluating the degree of tensioning, in answer to criticisms [cf. *F.A.* 19 No. 3469].

1045. Peklo, M. I., *et al.* Pravka strogal'nyh pil. [**Straightening and tensioning planer saws.**] *Derev. Prom.* 7 (6), 1958 (17–20). [Russ.] P.R.

An account of some of the main faults occurring in planer-type saws, and recommendations for overcoming them.

1046. Peklo, M. I. Kruglye pily bez uširenija režuščego venca. [**Circular saws without set.**] *Derev. Prom.* 7 (1), 1958 (10–1). [Russ.] P.R.

Investigations were made at CNIIMOD on the sawing of Pine samples 20–100 mm. thick and 1500 mm. long, at feed speeds of 6–36 m./min., with (*a*) an ordinary circular saw with a smooth disc, 350 mm. diam., edge 2·7 mm. thick, 48 teeth, hook 25°, sharpness angle 53°, clearance angle 12°, and (*b*) a taper-ground saw with a small angle of taper, 400 mm. diam., edge 2 mm. thick, and having the

same number of teeth and tooth angles. Examination of the sawn surfaces showed that it was possible in many cases to use these saws instead of planer-type saws (hollow ground and without set), which are expensive to buy, and difficult and costly to maintain. 'Axial knock' [lateral vibration] in the kerf amounted to 0·3–0·4 mm. with (*a*) and 0·5–0·6 mm. with (*b*). The friction and deformation of circular saws are discussed, and it is concluded that if a saw works under conditions where there is no deformation, if there is no roughness on its lateral surfaces, and if the adjustment of the machine imposes no lateral loads on the saw blade, then there is no need for set.

1047. MALYŠEV, V. V. Kruglye pily s plastinkami iz tverdyh splavov. [**Circular saws with hard-alloy tips.**] *Derev. Prom.* 6 (8), 1957 (9–11). [Russ.] P.R.

An account of the design, manufacture, and practical trials of ripsaws having hard-alloy cutting tips welded to the teeth.

1048. Tikon—die konische Bandsäge. [**Tikon—a bandsaw blade of 'conical' [trapezoidal] cross-section.**] *Int. Holzmarkt.* 1958 (14/15), (32–3). [G.]

Discusses the advantages of a bandsaw blade of Austrian manufacture, the back of which is at least 30% narrower than the tooth-line. It is claimed that it requires a set of only 0·1–0·2 mm. each way, cuts cleaner with less power consumption and less kerf, is less liable to breaking or binding, and requires less maintenance than blades of rectangular cross-section.

1049. BEL'MAČ, M. I. Novaja stacionarnaja cepnaja pila. [**A new, stationary chain saw.**] *Lesn. Prom.* 1958 (7), (14). [Russ.]

Describes the design and lists the specifications of the Soviet SibLTI-2 electrically driven chain saw, which, in tests, cross-cut logs of 10–90 cm. diam. at a rate 3–4 times that of portable chain saws.

1050. DANCEVIČ, M. N., and LUŠKIN, A. V. Prostejšaja ustanovka dlja razdelki hlystov na vode. [**A simple installation for cross-cutting tree-length logs on the water.**] *Lesn. Prom.* 1958 (6), (9). [Russ.]

Bundles of tree-length logs are untied in the water and the logs passed one by one to a floating platform which has a cradle consisting of 2 lifting arms. These lift each log out of the water, to meet a pendulum circular saw, mounted on a horizontal arm descending to cross-cut it. The rate of work is said to be 150 cu.m. of wood cross-cut per shift by 4 men.

1051. Es. Der fühlergesteuerte Sägenschränk-Vollautomat. [**A feeler-controlled fully automatic saw-setting machine.**] *Holz-Zbl.* 84 (89), 1958 (1156). [G.]

The spring setting in this German machine is controlled by an electronic 'feeler' device which causes the machine to correct for spring-back in each tooth by repeating the bending process until the desired set is achieved with a tolerance of ± 0·02 mm. It corrects for other faults also, e.g. excessive original set, or uneven tooth-line. It sets circular, frame, and band saw-blades of various sizes and patterns at ca. 20 teeth/min.

1052. **Cutting with vibrating tools.** *Rep. For. Prod. Res. Bd., Lond. 1957*, 1958 (20).

Following Russian claims [cf. *F.A.* 17 p. 144] small-scale experiments were carried out. Although of no practical significance so far, they have established the possibility of cutting in this manner with negligible amounts of waste. Further experiments are planned. Apparatus and experiments are described.

823. Planing, Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning

See also Nos. 997, 1032–4.

1053. PAHLITZSCH, G., and SCHULZ, K. Schnittkraftmessung und Schneidenabstumpfung beim Hobeln von Holz mit kreisender Schnittbewegung. [**Planing with rotary cutters: measuring the cutting force and edge wear.**] *Holz Roh- u. Werkstoff* 15 (4), 1957 (159–70). 14 refs. [G.g.e.] P.R.

A new method and experimental apparatus are described for measuring the impulses of tangential forces on a high-speed rotary-cutter shaft. The following factors were investigated: tools (cutting edge, knife angle); cutting conditions (cutting width, cutting speed, cutting depth, feed speed), and properties of the material planed. A photographic method was developed to assess the condition of the cutting edge. Evaluation of results showed no direct relation of cutting forces to density and hardness, but there appeared to be some correlation between splitting strength and cutting force. With Spruce and Beech a moisture content between 3 and 13% has no marked influence on the main cutting force. This rises to a maximum at a m.c. of 21% but subsequently falls to fibre-saturation point. The maximum force is ca. 35% greater than that of a m.c. range of 0–13% [cf. *F.A.* 13 No. 1546]. The woods tested, in order of machinability, were: Alder, Pine, Teak, Oak, Spruce, Poplar, Beech.

1054. ALEKSEEV, A. V. Povyšenie iznosostojkosti strogal'nyh nožej. [**Increasing the wear resistance of [rotary] plane cutters.**] *Derev. Prom.* 6 (7), 1957 (13–6). 8 refs. [Russ.russ.] P.R.

Investigations at the S. M. Kirov Leningrad Academy of Wood Technology on the wear of cutters, and on methods of reducing it, were made with cutters of U 8 G A carbon steel, of sharpness angle 40°, cutter speed 18 m./sec., and cutting angle 55°; removing a layer 2 mm. thick. The wood used was Birch, fairly free from knots, of density 0·59 g./c.c., and 12–14% m.c. Cutter wear took the form of a groove on the face, and a chamfer on the back. The cutting angle and the thickness of the layer removed had no significant influence on the type of cutter wear. However, self-sharpening during work, which occurs with carbon-steel cutters on dry wood, does not occur on green or wet wood. The original smoothness of the surface of the cutting face has a significant influence on its wear and blunting, Class 9 smoothness (Soviet Standard GOST-2789-51) being the best, raising the wear

resistance by 30–35%. Further investigations on methods of preparing cutters showed that addition of a back bevel 0·3 mm. wide increased wear resistance up to 20%, but did not improve the wood surface. Variation of cutting angle from 55° to 85° had no influence on the microgeometrical character of the blunting, but did influence the extent of both wear and blunting. A cutting angle of 75° and a sharpness angle of 60° were the optimum values. Alloying the surface of the cutter face with tungsten gave greatly improved heat resistance; hard plating with chromium increased wear resistance 3–4 times, and electro-hardening by 30–40%. [Cf. *F.A.* 20 No. 1032.]

1055. GEBRÜDER SCHMALZ, K. G. **Improvements in or relating to woodworking machines.** *Brit. Patent* No. 795,635, 1958. pp. 3 + 3 dgms. P.R.

Complete specification of a single- or multi-sided planing and polishing machine with which it is possible to provide timber with a polished surface ready for varnishing and with accurately placed side profiles, e.g. tongues and grooves.

824. Forms of Joint. Jointing and Assembly

824.1. Nailed Joints

1056. ANDERSON, L. O. **Nails and their characteristics in boxes and crates.** *Repr.* from *Package Engineering* April, 1958. pp. [5]. 2 refs. P.R.

An illustrated review of nail types and of the factors affecting the direct and lateral withdrawal resistance, with details of a simple chemical procedure for etching nails, developed at Madison.

1057. MACK, J. J. **Withdrawal resistance of grooved nails.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 242, 1958 (3–4). 2 refs.

Tabulates the withdrawal resistance % (plain nails = 100) of nails of various length, gauge and metal, with annular and helical grooves, in initially green and dry timber, immediately after driving and 4 and 8 months later. The grooved nails' immediate resistance in both green and dry timber and after the delay period was greater, actually increasing after driving, while that of the plain nails fell considerably. [Cf. *F.A.* 13 No. 4246.]

824.4. Dowelled Joints

1058. VELJAKOV, N. M. O pročnosti škantovyh soedinenij. **[The strength of dowelled joints.]** *Derev. Prom.* 7 (4), 1958 (15–6). [Russ.] P.R.

Develops formulae for calculating the strength of inserted single- and double-dowel joints (*a*) when the surfaces of the joined pieces do not touch, and (*b*) when they do. The accuracy of the formulae is confirmed by experiments made on pieces of Scots Pine with glued Birch dowels. The strength of the joints is greatest where the dowel diameter is ca. 50% of the thickness of the piece of wood; the optimum length of the dowel pin is 5·5–6·5 times the diameter.

824.6 Carpenters' and Joiners' Joints

1059. PAVLOV, V. P. Soprotivlenie kleevyh zubčatyh soprjaženij sžatiju i udarnomu izgibu. **[The resistance of glued multiple-scarf joints to compression and impact bending.]** *Derev. Prom.* 6 (3), 1957 (16–7). 1 ref. [Russ.russ.] P.R.

In continued experiments [cf. *F.A.* 16 No. 2228] glued multiple-scarf joints were subjected to (*a*) compression, and (*b*) impact bending tests. In (*a*) the geometrical shape of the joints had no influence on the strength, and blunting of the scarf-tooth arrises up to 3–3·5 mm. is considered permissible. In (*b*) blunting to 0·3 mm. decreased resistance to 20%, and scarf-tooth slopes of $\leq 1/8$, pitches of 8–10 mm., and blunting $\geq$ 0·3 mm. are recommended.

1060. KULIKOV, I. V. O pročnosti kleevyh šipovyh soedinenij v uslovijah ėkspluatacii. **[The strength of glued tenon joints in working conditions.]** *Derev. Prom.* 7 (3), 1958 (10–3). [Russ.russ.] P.R.

Gives details of shear-strength measurements on glued mortise-and-tenon joints that represented all the possible combinations of moisture content of the mortise and tenon pieces in respect to each other and to their equilibrium m.c. From examination of the results, formulae are developed to determine (1) the strength of the joints under working conditions, and (2) the original m.c. of the joined pieces, for a given max. strength of the joints in work.

824.8. Glues and Gluing

See also Nos. 998, 1059–60, 1109–10.

1061. **Corrosion of cadmium-plated metal by wood and glues.** *Rep. For. Prod. Res. Bd., Lond. 1957*, 1958 (42).

Details are given of the corrosive effect, particularly in damp conditions, of volatile compounds from various plywood glues. The extreme variability in corrosive effect, even with glues from the same type of resin, is ascribed to the different hardeners used.

1062. SODHI, J. S. Über die Säure-Schädigung von Holz bei der Verleimung mit Phenolharzleimen. **[Acid corrosion of wood glued with phenolic resins.]** *Holz Roh- u. Werkstoff* 15 (6), 1957 (261–3). 12 refs. [G.g.e.] P.R.

Although, under the experimental conditions, the decrease in strength (impact and static bending) is due solely to the acid corrosion of the wood, the decrease in bonding strength after acid-curing of the synthetic glues is caused by acid corrosion of the hardened glue-line and a concurrent reduction of its elasticity. The glue solution must have a minimum pH value (2·70 for 'P600') for maximum strength in the joint. A pH value of 2·7–3·0 will prevent corrosion.

1063. VAŠČEV, N. V. Vlijanie vlažnosti vozduha i drevesiny na pročnost' kleevyh soedinenij. **[The influence of humidity and wood moisture content on the strength of glued joints.]** *Derev. Prom.* 6 (4), 1957 (6–8). [Russ.russ.] P.R.

Sample pieces of Scots Pine and Oak, all of 8% m.c., were glued with (*a*) bone, (*b*) casein, and (*c*) urea glues. The m.c. of the samples was then increased and the air humidity raised correspondingly. Measurements of the shear strength of the joints showed that, with both species, an increase

in wood m.c. to 13% in the case of (*a*), and to 17–18% in the case of (*b*) and (*c*) had no significant effect on the strength of the joint. The ranges of wood m.c. at which the various glue joints fulfil requirements are tabulated, and nomograms are presented for determining the strength of glued joints of Pine and Oak for various humidities at an air temperature of 20° C.

1064. HRULEV, V. M. Ob ispytanii dolgovečnosti kleenoj fanery. [**Tests on the durability of glued plywood.**] *Derev. Prom.* 7 (1), 1958 (4–7). 3 refs. [Russ.] P.R.

Tabulates the strength of 3-ply samples glued with 7 common natural and synthetic Russian glues after the samples had been (*a*) soaked in water at room temperature for 1·5–12 months, (*b*) alternately soaked for 2 days and dried out for 12–14 days at room temperature, for periods of 1·5–12 months, and (*c*) exposed to the open air for 1·5–12 months. Results are compared with those of samples given the VIAM (All-Union Institute for Aviation Materials) accelerated-ageing treatment consisting of 1–30 cycles, each of 48 hr. soaking, 9 hr. freezing at − 20° C., 15 hr. thawing at room temperatures and 10 hr. drying at 70°. Also tabulates the results of 13 different standard methods of accelerated testing of 3-ply samples, glued with the same seven glues, and compares them with results of testing in a dry state.

1065. HRULEV, V. M. O kontrole kačestva sklejki fanery. [**Quality control in the gluing of plywood.**] *Derev. Prom.* 6 (6), 1957 (13–5). [Russ.] P.R.

Briefly discusses Russian, British, American, Indian, Australian, New Zealand, German and Jugoslav standards on the strength of glue in plywood, and then lists the results of 8 different methods of testing glue strength in 3-, 5- and 7-ply sheets of Birch veneers 1·5 mm. thick, glued together by phenol, urea, albumin-casein, and casein-albumin resins. The methods used were boiling in water for different periods, and soaking in water of various temperatures for different periods. All the methods of testing revealed glue strengths > 12 kg./sq. cm., the minimum set by the Soviet Standard GOST 3916–55.

1066. SELBO, M. L. **Curing rates of resorcinol and phenol-resorcinol glues in laminated Oak members.** *For. Prod. J.* 8 (5), 1958 (145–9). 1 ref.

Tests with 3 resorcinol and 2 phenol-resorcinol glues in making 4½ × 6-in. beams from ¾ × 6-in. flat-sawn White Oak boards at temperatures from 80 to 170° F. indicated that curing time increased exponentially with decreasing temperatures. A schedule of recommended times at different temperatures is presented. Curing at room temperature, though lengthy, should be possible provided that shrinkage stresses can be prevented.

1067. PERKITNY, T., ZENKTELER, M., and SZYDŁOWSKI, A. Wpływ błędów popetnianych przy produkcji sklejki bakelitowej na wytrzymałość spoin klejowych. [**The influence of manufacturing defects on bond strength in resin-glued plywood.**] *Prace Inst. Tech. Drewna* 4 (2), 1958 (59–80). 4 refs. [Pol.russ.e.] P.R.

The effect on plywood was studied when (1) veneer was dried too little or too much, (2) too little or too much glue (phenol-, cresol- or xylenol-formaldehyde) was applied, (3) temperatures during setting exceeded the optimum and the time of setting was prolonged, and (4) temperatures during pressing were above or below the optimum, and the pressing time shorter or longer than necessary. Tests of shear strength were then made on a total of 1440 samples, each of 5 sq. in., 3-ply Birch/Pine/Birch or Birch/Alder/Birch, (*a*) in a dry condition and (*b*) after boiling for one hour. Technological defects decreased the average strength and also increased the coefficient of variation and the range of strengths observed; the influence of defects being more marked in (*b*). Cumulation of technological defects did not lead to a proportionate and evenly distributed decrease in the strength of the bond, but in some places the bond was very weak, in others sufficiently strong. It is emphasized that tests of a plywood panel should not be made on small samples from that panel.

1068. PETROV, G. S., DERKOVSKAJA, I. L., and PESIN, L. M. Karbamidnye klei dlja skleivanija drevesiny. [**Urea glues for gluing wood.**] *Derev. Prom.* 6 (3), 1957 (14–6). [Russ.russ.] P.R.

Describes tests on the glue K-17 with Hornbeam, Beech, Oak, and Scots Pine wood, and also two new types of urea-formaldehyde resins, one combined with xylitol and the other with furfurol.

1069. ŠESTIALTYNOV, S. I., and BERDNIKOV, V. I. Vspenivanie karbamidnoj smoly pod davleniem. [**The foaming of urea resins under pressure.**] *Derev. Prom.* 6 (7), 1957 (19–20). [Russ.] P.R.

Describes investigations at the Rostov-on-the-Don furniture factory, showing the advantages of foamed resins over non-foamed, and describes the apparatus constructed there for foaming. Each charge takes ca. 20 min. to foam, using an air pressure of 2·5 atm. The foamed resin has a density of 0·3–0·4 g./c.c. [Cf. *F.A.* 19 No. 3486.]

1070. PLOTNIKOVA, G. P., MIRKOVIČ, R. A., and ZABRODKIN, A. G. Plenočnye klei dlja mebel'noj promyšlennosti. [**Film glues for the furniture industry.**] *Derev. Prom.* 6 (7), 1957 (7–9). 2 refs. [Russ.] P.R.

Describes the advantages of film glues, and shows graphically the shear strength of 3-ply Birch plywood bonded with urea-melamine-formaldehyde film glues, containing 30–120 g. glue per sq. m., (*a*) in a dry condition, and (*b*) after soaking for 48 hours in water at 20–25° C.; tabulates also the shear strength of similar plywood samples prepared with press temperatures ranging from 110–125° to 140–145° and pressures of 6 to 25 kg./sq. cm., (*a*) under dry conditions, (*b*) after 48 hours' soaking in water at 20°, and (*c*) after 1 hour in boiling water. Pressing temperatures of 115–120°, and pressures of ca. 15 kg./sq. cm. are considered satisfactory in furniture making.

1071. SEVAST'JANOV, K. F. K voprosu ob otverždenii karbamidnyh smol. **[The hardening of urea resins.]** *Derev. Prom.* 7 (2), 1958 (9–11). [Russ.] P.R.

Defines by graphs the interrelationships between the temperature of plywood assemblies during hot pressing, the temperature of the heat source, the quantity of NH_4Cl in the resin, the heating time, the temperature increase in the assembly as a result of exothermal reaction, and the % of resin hardening. An example shows that, with a heat source of 160°C., 50% hardening can be obtained in 5 sec. at an assembly temperature (a.t.) of 82°; with a heat source of 135°, 50% hardening is obtained in 19 sec. at a a.t. of 95°. At 65% hardening, the a.t. with the 160° source is higher than that with the 135° source.

1072. PETROV, A. K. Skleivanie gnuto-propil'nyh detalej v pole ,tokov vysokoj častoty. **[Gluing units of bentwood with kerfs, by R.F. heating.]** *Derev. Prom.* 7 (3), 1958 (1–3). [Russ. russ.] P.R.

Gives the results of experiments which provided knowledge of the time necessary to cure units of various sizes with the urea-formaldehyde resins M-70, MF-17 and MFS-1. [Cf. *F.A.* 19 No. 4856.]

1073. WILLIAMSON, F. L., and NEARN, W. T. **Wood to wood bonds with epoxide resins—species effect.** *For. Prod. J.* 8 (6), 1958 (182–8). 25 refs.

The tests involved the use of 1 epoxy resin with 3 different hardeners (plus 1 resorcinol resin as control), 9 wood species, and 2 curing temperatures (70 and 160° F.). Only two of the formulations were satisfactory with stronger woods, although all three could be used with low-strength wood. The resins were not water-resistant when cured at room temperatures, but water resistance was improved by curing at a high temperature (160° F.). The higher curing temperature caused no significant improvement in bond strength and in some cases bond strength decreased with an increase in curing temperature. There was no well defined species preference among these adhesives when used on high-strength woods, but Redwood (a low-strength wood) gave uniformly good results.

1074. JANSON, Ė. R. Vlijanie kačestva poverhnosti drevesiny na process skleivanija. **[The influence of the quality of the wood surfaces on the gluing process.]** *Derev. Prom.* 6 (6), 1957 (11–3). 8 refs. [Russ.] P.R.

Continued experiments [cf. *F.A.* 18 No. 976] have shown the shear strength of glue joints with the smoothest surfaces (hand-planed) to be similar to that of joints with the roughest surfaces (frame-sawn), while glue joints of intermediate surface smoothness (e.g. machine-planed) were less strong. Bond strength depends primarily on the mechanical strength of the wood surfaces, which is affected by the method of surface preparation, and on the glue itself. Surface roughness and woolliness have a positive influence on the gluing process by increasing the glue surface, thick glue lines becoming highly irregular.

1075. PERKITNY, T., and ZENKTELER, M. Klejenie na gorąco i jednoczesne impregnowanie wielkowymiarowych elementów drewnianych metoda 'Imperkol'. **[Hot gluing and simultaneous impregnation, by the Imperkol process, of timber assemblies of large dimensions.]** *Prace Inst. Tech. Drewna* 4 (1), 1957 (3–187 + 2 tbls.). 23 refs. [Pol.russ.e.] P.R.

Describes the Imperkol process devised by the Polish Institute of Wood Technology [cf. *F.A.* 19 No. 4867]. Exhaustive tests in 1955–56 showed that the process takes ca. 3 hours but it may be speeded up by forced circulation or increasing the temperature of the preservative. More thorough impregnation can be obtained by immersing the hot assembly units in a cold preservative for 20 min. Any timber species and any glue that can be heated to 140° C. may be used. An initial moisture content a few % higher than for other methods is permissible for timber to be bonded by the Imperkol method, as the hot oil helps to dry out the wood and evaporation from the inner layers of wood is made possible by the grooves. Wood bonded by this method with phenol-formaldehyde and creosote may be used for straight or curved laminated units, for vehicle and machine structures, shipbuilding and constructional purposes. An Imperkol plant is being built in Poland, using Pine and Oak for harbour and mine construction purposes. Results of further experiments will continue to be published.

1076. SANDWEG, K. Zwanzig Jahre Hochfrequenz-Holzverleimung. **[Twenty years of high-frequency wood gluing.]** *Holz Roh- u. Werkstoff* 15 (4), 1957 (174–89). 22 refs. [G.g.e.] P.R.

Surveys the development of techniques and chief fields of application.

1077. GUBENKO, A. B., *et al.* Skleivanie drevesiny s progrevom tokami vysokoj častoty. **[R.F. heating in gluing wood.]** *Derev. Prom.* 6 (8), 1957 (3–6). [Russ.russ.] P.R.

Experiments have shown urea-formaldehyde glues to have the best dielectric properties, and these glues should be used with R.F. heating for all units not likely to come in contact with moisture. In other cases, phenol-formaldehyde glues should be used, without hardeners for wood m.c.'s up to 10%, and with hardeners for greater m.c.'s. R.F. can range from 3 to 25–30 megacycles/sec., and the optimum frequency depends on the dimensions of the work-pieces and should be found for each individual case. The minimum heating times and glue-line heating temperatures are given for several glues.

1078. NOVIKOV, D. Z. Opyty po naklejke nastila parketnyh dosok. **[Experiments on gluing-on the tops of parquet boards.]** *Derev. Prom.* 7 (3), 1958 (3–5). [Russ.] P.R.

Strips of softwood were glued together to make slabs of 350 × 175 × 35 mm., forming bases on which Beech or Oak parquet 175 × 35 × 7 mm. was to be glued. Various electrode set-ups were tried during experiments on R.F. heating. The best had two electrodes fixed perpendicularly at the glue line, and fed from a generator, and with a rectangular

copper tube above and along the parquet slab, acting as an earthed electrode. Used with 8–10 kg./sq. cm. pressure, a frequency of 10–12 megacycles/sec., and 5000–5500 volts fed to the electrodes, this set-up gave the best results, shear tests showing the glue line strength in most cases to be greater than that of the wood.

1079. VA. Infrarot-Dunkelstrahler für Gehäuseverleimung. **[Infra-red dark radiation for the gluing of casings.]** *Holz-Zbl.* 84 (73/74), 1958 (941). [G.]

Describes equipment projecting rays in sharply defined fields so that glue lines can be cured without materially heating the surrounding area. It is claimed that even lacquered articles can be so treated. These 'vertical radiators' are supplied to project fields of 400–1000 × 40–125 mm. and also pinpoints for corners etc.

826. Peeling. Slicing. Trimming, Edging etc. of Thin Sheets

1080. VOSKRESENSKIJ, S. A. Rasčet processov luščenija i stroganija. **[Calculation of processes in peeling and slicing.]** *Derev. Prom.* 6 (10), 1957 (19–20). 1 ref. [Russ.] P.R.

A mathematical examination of some of the processes involved, with the aim of calculating pressures to avoid the formation of checks and splits in veneer peeling. Much of the information is from the author's work 'Cutting wood' (Goslesbumizdat, 1955).

1081. FEIHL, A. O. **Reducing heat distortion in the knife and pressure bar assemblies of veneer lathes.** *For. Prod. J.* 8 (7), 1958 (216–8).

Describes successful experiments in reducing and almost eliminating the distortion of horizontal and vertical knife gaps, resulting in uneven veneer, caused by the heat transmitted from hot logs. This is done either by heating the lathe uniformly to 130° F. by electrical elements, or preferably by cooling it by water-cooling elements.

1082. FEIHL, A. O. **Veneer and plywood from Aspen Poplar.** *Repr.* from *Canadian Woodworker*, *Toronto* Jan. 1958. pp. [3].

Presents research results on the effect of a number of variables on veneer quality; viz. veneer thickness; angle of veneer knife at various diameters; pressure-bar lead and gap; knife level; shape of pressure-bar edge; bolt diam.; and bolt temperature. Tests were on 20 logs from Saskatchewan and Ontario. Data are given on the veneer yield and grade and results of gluing tests.

1083. NAKAMURA, G. **[Studies on rotary lathe cutting. Report (1) Effect of cutting conditions upon the quality of Japanese Beech (Buna) veneer.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 101, 1957 (177–97). 11 refs. [Jap.jap.e.*e*.]

Uniform test-pieces of *Fagus crenata* were heated in water (50–80° C. for 10–24 hours) and cut at 26 rev./min. in the 60–30 cm. diameter range into thicknesses of 1, 2, 3, 4 and 6 mm. with cutting angles of 18°, 21° and 24° at various pressure-bar openings (expressed as % of veneer thickness). Conclusions are that the pressure-bar opening should be 80–90% for these thicknesses. At 80%, lathe checks were almost completely eliminated but thickness was slightly reduced. These checks were least at a cutting angle of 18°. Roughness (recorded by travelling needle and reduced to frequency histograms of the heights of peaks above valleys, allowing for an oscillation of 25μ, the vessel diameter) was least at 85–90% opening for all thicknesses and cutting angles. The tensile strength $\perp$ varied from 5 to 30 kg./sq. cm., the better values appearing particularly in the veneers of 1–3 mm. with the 80–90% openings. In the 6-mm. veneer this strength increases in inverse proportion to the pressure-bar opening above 70%.

827. Bending. Moulding (other than by Cutting)

See also Nos. 1072, 1122.

1084. **Wood bending.** *Rep. For. Prod. Res. Bd., Lond. 1957*, 1958 (11).

Although no very marked differences have been observed in an examination of home-grown Ash, the best bending timber came from a S. Wales site. Data have been obtained on 6 tropical woods including Yellow Seraya (*Shorea faguetiana*), Pillarwood (*Cassipourea malosana*, syn. *C. elliottii*) and E. African Mulberry (*Morus lactea*). The last is considered a promising substitute for Beech, despite its yellow colour. Pillarwood had a marked tendency to split and distort. Large-scale tests, now completed, have shown Horse Chestnut, and especially European Walnut to have excellent bending properties. Heating and drying in an R.F. electrical field led to the finding that Beech with red heart tends to develop internal splits, due to tyloses impeding the free egress of steam. A method was evolved to reduce losses occasioned in making bends of a small radius economically from home-grown Ash. This method was demonstrated to makers of sports goods, e.g. hockey sticks, anxious to compete with the imported article.

1085. HUHRJANSKIJ, P. N. Podšipnik skol'ženija iz drevesiny torcovogo gnut'ja. **[Sliding [plain] bearings from end-grain-bent wood.]** *Derev. Prom.* 4 (11), 1955 (17–8). [Russ.] P.R.

The following method of end-grain bending was developed at the Voronezh Forestry Institute: a blank is cut across the grain from a board or plank, steamed at 100–105° C. for 10–20 min. and then bent so that the transverse faces become the inner and outer surfaces of the bend [method illustrated]; it is finally dried to 8–10% m.c. Semi-circular shapes or full rings can be obtained. Internal bearings (bushes) from this material do not swell radially in water, their compression strength (along the grain) is very high, and their coefficients of friction with pure or abrasive-contaminated lubricants compare favourably with bushes from other materials. The wear of the journal is also very small. The wood of diffuse-porous hardwoods can be end-grain bent both in the radial and tangential directions, that of conifers and ring-porous hardwoods in the radial direction only. The lower the density of the wood, the greater the allowable degree of compression during

end-grain bending. An expression for the bending moment involved is derived; its calculated values agree well with the experimental ones. End-grain-bent bearings are easily impregnated with lubricants, which they hold well on the friction surface.

1086. ŠEJDIN, I. A. O tehnologii proizvodstva zagotovok vtulok, spressovannyh iz karandašej. [**A technique of producing bushes, pressed from veneer-bolt centres.**] *Derev. Prom.* 6 (9), 1957 (16–7). [Russ.] P.R.

The technique, developed by P. N. Huhrjanskij of the Voronezh Agricultural Institute, consists basically of a preliminary drying of the bolt centre, steaming, 'contour pressing' (pressing through a conical guide into a tubular section of the required size) and final drying. Values are given for the compression ||, static bending, Brinell hardness ||, and density of compressed pieces made by this process. The service life of plough and cultivator axles having bushes made from these compressed centres is increased 2–5 times and the bushes themselves wear less than cast-iron ones. Details are given of their coefficients of friction, wear under different conditions, and swelling due to moisture. Their low resistance to water and moisture leads to significant dimensional changes, but their other advantages are held to outweigh this.

1087. SOKOLOVSKIJ, F. M. Gnuto-kleenye detali zamknutogo kontura. [**Bent and glued pieces of circular shape.**] *Derev. Prom.* 6 (9), 1957 (7–9). [Russ.] P.R.

Describes a process used to construct chair-seat frames, hoops etc. from bent and glued laminae.

1088. KUZNECOV, M. A. Rasčet davlenija pri zapressovke krivolinejnyh poverhnostej. [**Calculation of pressures in pressing curvilinear surfaces.**] *Derev. Prom.* 7 (4), 1958 (3–5). [Russ.] P.R.

Deals with surfaces of glued laminae, plywood etc. of various configurations, as used in boat- and coach-building, furniture manufacture etc.

829.1. Finishing

See also Nos. 963, 1165.

1089. CARLSON, B. L. **Veneer and lumber void filler.** *For. Prod. J.* 8 (5), 1958 (32 *A*).

Describes a process of continuous patching, using a viscous paste made of a special phenolic resin, a catalyst, and fillers such as bark, asbestos or clay.

1090. GRAY, V. R., and OLIVER, A. C. **External clear finishes for timber.** *Wood* 23 (6; 7), 1958 (237–9; 297–9). 3 refs.

Discusses the use of oils, sealers, water repellents, and various types of preservative varnishes to combat weathering, and also factors affecting the life of varnishes.

1091. KAČAN, V. F. Okraska drevesiny v ėlektričeskom pole koronnogo razrjada. [**Paint-spraying of wood in the electric field of a corona discharge.**] *Derev. Prom.* 7 (6), 1958 (6–8). 6 refs. [Russ.russ.] P.R.

Describes the experimental method used at the L'vov Institute for Wood Technology, and makes recommendations on the apparatus to be used for this kind of paint spraying. The method results in a significant reduction in paint losses, the electrically charged particles being drawn to the surface of the wood; it gives a uniform layer of paint of any desired thinness; it reduces the space required for spraying and improves the working conditions; and admits of full automation. The disadvantages are the unsatisfactory coverage of paint on pieces of complex shape with hollows etc., and the increased fire danger.

1092. ANDERSSON, B., and NYLÉN, P. Utomhusfärger för trä. [**Exterior house paints for wood.**] *Rapport, Statens Nämnd för Byggnadsforskning, Stockholm* No. 42, 1957. pp. 84. 74 refs. [Sw.e.] P.R.

Describes Swedish tests in 1944–48 and 1952–55, and summarizes experiments elsewhere (chiefly in America and the Netherlands). Results cover the effects of different primers, of pressure impregnation before painting, type of paint etc. Paint on unplaned wood was more durable than that on planed surfaces.

83. Timber Manufacturing Industries and Products. Uses of Wood as Such

1093. **Eastern States Timber Industry Stabilisation Conference.** *Aust. Timb. J.* 24 (6), 1958 (34 . . . 103).

Reports, with discussions, papers by millers and foresters from 5 Australian States and New Guinea on trading conditions, waste utilization, tariffs, work balance between breakdown saws and resaws, indicating the savings effected by more sawing by accurate breakdowns, firmly and precisely set up (*D. S. Jones*), use of total mill run, negative attitude of millers to research etc. The British Commonwealth Forestry Conference's recommendation to use true volume measurement is endorsed.

831. Fuelwood and Various Types of Rough Timber

See also Nos. 332, 556–7, 853, 1142–9, 1179–80, 1183.

1094. HARDER, H. Der Holzmast im Freileitungsbau. [**Wooden poles for transmission lines.**] Verlags- und Wirtschaftsgesellschaft der Elektrizitätswerke m.b.H., Frankfurt a.M. 1957. pp. 34. [G.] From *abstr.* in *Holz-Zbl.* 84 (81), 1958 (1058).

Discusses and illustrates the effect of various interior and exterior decay injuries on static properties, distinguishing 4 classes of reduced strength, and giving instructions and tables for the computation of safety margins etc.

1095. Technische Lieferbedingungen für ungetränkte Holzschwellen, nach UIC-Merkblatt 863 mit Ergänzungen der Deutschen Bundesbahn. [**Technical regulations for the supply of non-impregnated sleepers according to UIC [International Railway Union] leaflet 863 with supplement by the German Federal Railways.**] *Holz-Zbl.* 84 (71), 1958 (909). [G.]

Covers species, specifications, inspection etc.

1096. STEJMACKIJ, R. M. Voprosy razvitija špalopilenija. [**The increase in sleeper production.**] *Lesn. Prom.* 1957 (9), (27–8). [Russ.]

Breaks down the U.S.S.R. sleeper production into its 9 main geographical regions for the years 1950, '52, '55 and '56. Although total production in 1956 was 4·9% less than in 1950, the significant trend for the period is the increased production in the Karelian A.S.S.R., E. and W. Siberia, and the Far East, coupled with a reduction in the other European parts of the country. Sleeper production according to classes and types is analysed for pre-war years, and in more detail for post-war years.

1097. FRAŠTIA, P., and ZALČÍK, R. Úsporný a trvanlivejší borovicový podval. [**Economical and more durable Pine sleepers.**] *Drev. Výskum* 2 (2), 1957 (141–64). 7 refs. [Slovak.russ.g.e.] P.R.

Describes sleepers manufactured from Pine cants 260 cm. long, 12 cm. thick, the bottom face 25 cm. wide and the top face 20 cm., with a minimum unbevelled side of 7·3 cm. On the top face Beech chairs 60 × 20 × 3 cm. are glued with FR55 phenol-resorcinol glue. This method offers increased utilization of Pine and also of low-grade Beech timber. The sleeper can bear axle pressure of 25 tons and is expected to have the same service life as a standard Beech sleeper, but is less expensive to produce.

832. Mills, Their Functions and Products

1098. MININ, A. N. Mokryj fil'tr i vertikal'nye otstojniki dlja pnevmotransportnyh sistem. [**A wet filter and vertical sediment traps for pneumatic conveyors.**] *Derev. Prom.* 6 (10), 1957 (9–10). [Russ.] P.R.

Describes the design and advantages of the FM-2 unit, designed by the S. M. Kirov Byelorussian Institute of Forest Technology, for removing wood dust from the air.

832.1. Sawmills and Planing Mills

See also Nos. 1029 *et seq.*, 1093.

1099. HYLER, J. E. **Modern sawmilling. Parts 96–101.** *Sth. Lumberm.* 197 (2454–2460), 1958 (35 . . . 40; 41 . . . 44; 37 . . . 44; 43 . . . 50; 37 . . . 44; 39 . . . 44).

Parts 96–97, end-printing; Parts 98–101, resaws.

1100. **Log cleaning method.** *For. Prod. J.* 8 (6), 1958 (33*A*).

Describes a system developed by Deming Co., Salem, Ohio, whereby the logs, after soaking, pass through a battery of high-pressure spray nozzles. A turbine pumps the water from the pond, creating a pressure of 175 lb. for the nozzles. The water can be used repeatedly.

1101. GREEN, H. F. **Delayed-memory programming.** *For. Prod. J.* 8 (5), 1958 (30*A*–31*A*).

Instances potentialities and sawmilling applications of delayed-memory programming, defined as a means of controlling given functions, co-ordinated to occur at pre-determined times and places, stressing the need for flexibility, and illustrating its use by a schema of automated flow at Potlatch Forests Inc. sawmills.

1102. MINKOV, N., *et al.* Formuli i nomogrami za opredeljane randemana na trupite za bičene. [**Formulae and nomograms for determining recovery % in sawing logs.**] *Nauč. Trud. lesoteh. Inst., Sofia* No. 5, 1957 (219–34). [Bulg.russ.]

Starting with certain basic assumptions as to method of log breakdown, saw used, taper of logs etc., formulae are derived for calculating the maximum recovery % from first-quality logs of (1) coniferous species, (2) broadleaved species (excluding Beech and *Quercus cerris*), and (3) Beech. Nomograms are constructed for each of the 3 groups, and examples of their use given. [Many of the mathematical data and equations are repeated in the Russian summary.]

1103. [**Tools and equipment.**] *Lumberm.* 85 (8), 1958 (76).

Describes a portable gang mill (Gunderson Bros., Engineering Corp.) mounted on a semi-trailer 35 × 8 ft., able to cut 35,000 [bd.?] ft. in 8 hours. With it are an edger, power units, water storage for cooling the gang guides, and two 100-gal. fuel tanks. Other components are transported on a 16-ft. 4-wheeler. The prime mover is a GM diesel with twin-disc fluid couplings using a belt to the crank shaft.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 1061 *et seq.*, 1080–3, 1086–8, 1097, 1117–8, 1191.

1104. **Plywood and veneer annual 1958.** *Aust. Timb. J.* 24 (4), 1958 (50–130).

Contains 35 items covering the Australian industry, local and overseas uses (frames and box-girders, sound reflectors, concrete shuttering, carpentry, joinery and cabinet-making, boats, refrigerators, cars and bulk storage bins), factory lay-out and equipment, air and kiln drying, local research programme, splicing, slicing, sanding etc.

1105. JENKINS, J. H. **The plywood industry of Japan.** *Repr.* from *Canadian Woodworker, Toronto* April, 1958. pp. [5].

Includes information on output, methods, working conditions etc.

1106. Normas para tableros de madera. [**Standards for plywood and laminated wood.**] Ministerios de Industria y Agricultura, Servicio de la Madera, Madrid. [1958]. pp. 56 + 2 tbls. [Span.]

Covers terminology, types and classes of plywood and laminated wood, standard tests for determining quality, and grading.

1107. FLEISCHER, H. O. **A graphic method of estimating veneer drying rates.** *Rep. U.S. For. Prod. Lab., Madison* No. 2104, 1958. pp. 8 + 3 gphs. 4 refs. P.R.

The author has developed a formula for the drying of veneer, relating the drying rate to the major factors that affect it, as follows: Log $S = 2{\cdot}98 \ (\log \ T) + 0{\cdot}78 \ (\log \ V) - 1{\cdot}34 \ (\log D) - 11{\cdot}34$ where S is a value inversely proportional to

drying time [see *F.A.* 15 No. 3019], T = drying temperature in °F., V = air velocity in ft./min., and D = veneer thickness in inches. From this, drying-rate charts are developed.

1108. KIEFER, E. Moderne Trocknung der Feinfurniere. [**A modern drying process for thin veneers.**] *Holz* 12 (3), 1958 (30). [G.] P.R.

Describes a German-made drier in which the veneers are passed from one perforated cylinder to another by a system of intermittent suction which holds the veneers evenly round the cylinder but does not prevent their shrinking. The air sucked into the last cylinder is cold, so that the sheets are cooled before they leave the drier. The revolving speed of the successive cylinders is adjusted downwards to avoid stresses in transit. The heating elements are above and below the cylinders. Final moisture content, and air condition and speed of passage can be controlled automatically. It is claimed that the new drier saves space, labour, and steam, and reduced checks and waviness.

1109. SAMEK, J. Učinek kyseliny sírové a louhu sodného na mechanické vlastnosti vrstveného dřeva. [**The effect of H_2SO_4 and NaOH on the mechanical properties of laminated compressed wood.**] *Drev. Výskum* 2 (2), 1957 (207–33). 8 refs. [Cz.russ.g.e.] P.R.

Laminated compressed wood and ordinary wood of Beech, Larch and Pine were exposed for 3, 6 or 12 months to H_2SO_4 at concentrations of 3 and 30%, NaOH (2 and 10%), and water, at a normal temperature of 20° C. The laminated wood was glued with (*a*) cresol-formaldehyde, (*b*) phenol-formaldehyde, (*c*) epoxy- and (*d*) melamine resins, and impregnated with cresol resole. Tests were made of the compression, bending, and shear strength before and after exposure. Joints glued with (*c*) and (*d*) resins were waterproof and chemically resistant to H_2SO_4 and NaOH. Joints glued with (*a*) and (*b*) were waterproof and chemically resistant to H_2SO_4. Strength decreased after 3 months' exposure to H_2SO_4 and NaOH, and the decrease was about equal for compression, bending and shear strength. The laminated compressed wood glued with waterproof synthetic resins possessed only a slightly higher chemical resistance than the natural wood. Impregnation retarded the deterioration of the wood by both acid and alkali but after long exposure the decrease in strength was roughly the same as for natural wood. The lowest relative decrease of strength is observed in Pine and Larch.

1110. [**Research in laminated wood. Report I. On the fabrication and properties in respect to strength and adhesion of straight laminated wood.**] *Bull. For. Exp. Sta. Meguro, Tokyo* No. 101, 1957 (101–76). 15 refs. [Jap.jap.e.*e.*]

A detailed investigation covering selection of sample trees, sawing, drying, surfacing, strength checks of component laminae, laminate assembly, adhesion, glue-spreading, pressing and curing, using clear material of *Abies sachalinensis*, *Picea jezoensis*, *Picea glehnii*, *Quercus crispula*, *Fraxinus mandshurica*, *Betula maximowicziana* and *Fagus crenata* in one-species 5-ply laminates of 10 × 10 cm. cross-section. Resorcinol-formaldehyde resin (Plyophen 6000 with Plyophen 6002 hardener) was used. Results of strength and delamination tests are tabulated and the quality of the laminates is compared with U.S.A. standards. [Cf. *F.A.* 15 No. 4192.]

832.8. Integrated Mills and Combinations of Mills

See No. 1200.

833. Timber in Buildings and Engineering Structures (Manufacture and Use)

1111. Bauforschung und Holzwirtschaft. Laufende Forschungsaufträge für Holzbau und Holzschutz. [**Building research and the wood industries. Current research programmes for building with timber and wood preservation.**] *Holz-Zbl.* 84 (82), 1958 (1062). [G.]

Lists 30 projects including fireproofing, under investigation at the Otto-Graf-Institut, Stuttgart, the Technische Hochschulen of Karlsruhe and Braunschweig and Berlin, the Bundesanstalt für Materialprüfung, Berlin-Dahlem, the Institut für forstliche Mykologie und Holzschutz, Hann. Münden, and the Bundesanstalt für Forst- und Holzwirtschaft, Reinbek, with notes on results to date and expected dates [but not the medium] of publication.

833.1. Building Components and Fittings: General

See also Nos. 993–4, 1078.

1112. Schalplatten dienen der Holzeinsparung. [**[Pre-fabricated] formwork boards save wood.**] *Int. Holzmarkt* 1958 (14/15), (34–8). [G.]

Discusses the advantages, chiefly durability, ease of handling, saving of skilled labour, of the 'Nordland' standardized shuttering units (of Austrian manufacture) made from specially impregnated tongued-and-grooved boards glued together, with steel-reinforced edges and corners, and describes methods of fixing to scaffolding.

1113. ROLLER, W. L. **Utilization of native [Ohio] timber in farm buildings.** *Res. Bull. Ohio agric. Exp. Sta.* No. 807, 1958. pp. 18.

It is concluded, from a comprehensive study, that the lattice beam constructed of rough-sawn hardwood is a satisfactory method of using short pieces of timber in farm buildings. Glue is superior to nails, bolts or timber connectors for the fabrication of such beams and trusses.

1114. WEDLER, B. Hölzerne Hausdächer. [**Wooden house roofs.**] *Mitt. dtsch. Ges. Holzforsch.* No. 33 (6th ed.) 1957. pp. 170. 92 refs. [G.] P.R.

Discusses designs, materials, loads, and safety limits, with numerous illustrations of different types of roof.

1115. LUXFORD, R. F. **Light wood trusses.** *Rep. U.S. For. Prod. Lab., Madison* No. 2113, 1958. pp. 14 + 8 photos., 14 dgms., 12 gphs., 8 tbls. P.R.

A study was made of the relative efficiency of nailed and glued joints in the construction of light trusses. Results are given in full with graphs,

diagrams etc. The tests indicated that well designed nailed trusses with a slope of 4/12 or more should give adequate service. Glued trusses are much stiffer than nailed trusses and show less deflection, but are much more affected by changes in relative humidity; they are particularly suitable if of low slope.

1116. **Weatherboard timbers of New South Wales.** *Pamphl. For. Comm. N.S.W.* No. 17, 1957. pp. 7.

Includes a tabulated list of suitable species with air-dry and green weights.

1117. PETRI, V. N., *et al.* Ščitovoj parket, oblicovannyj drevesinoj berezy. [**Parquet slabs faced with Birch wood.**] *Derev. Prom.* 6 (6), 1957 (6–7). [Russ.] P.R.

An account of the manufacture of experimental quantities of parquet flooring made of glued Spruce strips, and faced with petrolatum-impregnated pieces of Birch [cf. *F.A.* 19 No. 3585] bonded to the Spruce by a phenol-formaldehyde glue. The petrolatum treatment improves the wear and appearance of the parquet, and mass-production of such flooring is considered practicable.

1118. KOLLMANN, F. Technische und chemisch-technische Probleme der Parkettherstellung. [**Technological and chemical-technological problems in the manufacture of parquet flooring.**] *Holz-Zbl.* 84 (89), 1958 (1153–6). 8 refs. [G.g.]

Discusses kiln drying, machining and its automation, and adhesives, with particular reference to the manufacture of mosaic flooring from thin pieces (ca. 9 mm. against the traditional 23 or 18 mm. of solid parquet flooring) glued on to sheets of paper. Adhesives based on thermoplastic resins have proved best.

833.3. Special Uses in Factories and Workplaces

1119. PAGE, M. W. **Use of wood in water-cooling towers.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 241, 1958 (1–3).

A general account of the problems, with brief notes on the use of species grown in Australia.

1120. **Cooling tower impellers in timber.** *Timb. Technol.* 66 (2228), 1958 (287).

Describes the manufacture of laminated fans made from White Seraya [*Parashorea* sp.].

834. Shingles. Cooperage. Packing Containers. (Manufacture and Use.)

See Nos. 499, 1056, 1184.

835. Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Applications etc.

See also Nos. 937, 1084–6, 1120, 1185.

1121. **[Australian] timbers for clothes pegs.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 243, 1958 (4).

Desiderata are strength and elasticity, lightness in colour and weight, and freedom from resin, gum and tannin. The last can be removed by hot-water extraction after manufacture, and bleaching sometimes assists. Sassafras [*Doryphora* sp. and *Daphnandra* sp.], White Birch [*Schizomeria ovata*], Radiata Pine, Hoop Pine and the Ash group of Eucalypts are suitable.

836. Furniture and Cabinet-Making. Carving. Marquetry. Wooden Ornaments

See also Nos. 1087–8.

1122. POLIKAŠEV, N. M., and FIL'KIN, A. I. O tehnologii izgotovlenija gnuto-propil'nyh zadnih nožek stula. [**The technique of preparing the rear legs of chairs from bentwood with kerfs.**] *Derev. Prom.* 6 (9), 1957 (5–7). [Russ.] P.R.

Describes the technique [cf. *F.A.* 19 No. 4856] and compares the costs of the legs, the raw material, and labour, for 6 different methods of manufacture.

1123. VORONOV, V. A. Izmenenie razmerov detalej i uzlov mebeli pri dal'nyh perevozkah. [**Dimensional changes of unit pieces of furniture and assembled furniture during long journeys.**] *Derev. Prom.* 7 (1), 1958 (16–7). [Russ.russ.] P.R.

On the basis of measurements of dimensional changes of pieces of Beech furniture sent from Maikop (N. Caucasus), and of Pine from Perm (N.E. region of the U.S.S.R.), in autumn and winter, in various kinds of packing, recommendations are made on the most suitable packing material and crates for long journeys.

838. Vehicles (including Ships, Boats, Aircraft)

See also Nos. 1088, 1165.

1124. HUDSON, R. W. **The moisture content of woodwork in motor cars.** Forest Products Research Laboratory, Princes Risborough. 1958. pp. 6. 2 refs. Limited distribution. P.R.

Tests in saloon models during 12 months' normal use in England, showed a m.c. range between 5·3 and 18% and a maximum variation during any one month (found in the luggage boot) of 3%. Defects appearing in decorative veneer panels (checks, distortion etc.) were traced to their swelling and shrinking under such moisture fluctuations and can be practically eliminated by better-quality groundwork and by conditioning this, and the plies and faces fixed to it, to ca. 12% m.c.

839.8. Industrial Waste Wood, its Processing and Uses

See also Nos. 1098, 1201–2, 1233–4, 1238–9.

1125. **Wood waste utilization. Chips, equipment, economics, molded products, finger-jointing, bark, sawdust, etc.** *FPRS Wood Technology Series, Madison* No. 22, [1957?] pp. 48. Several refs.

Reprints of 15 articles from *J. For. Prod. Res. Soc.* Vol. 4 and the *For. Prod. J.* Vols. 5 and 6, most of which were noticed in *F.A.* at the time.

1126. **A method of sawdust disposal for smaller mills in the interior Fir region.** *Protect. Bull. B. C. For. Serv.* No. 2, 1958. pp. 5.

Describes a simple installation for burning piles

of sawdust in an open burner. The burner is dependent on a conveyor system to deliver the sawdust into it as a symmetrical cone. The forced draught is supplied by a small blower powered by a 1- or 2-h.p. petrol or electric motor, and is delivered through an 8-in. steel pipe with a perforated cross or T-head in the centre of the burner.

1127. MININ, A. N. Briketirovanie izmel'čennyh drevesnyh othodov. [**Briquetting comminuted wood waste.**] *Lesn. Prom.* 1957 (8), (20–3). [Russ.]

Includes a description of the apparatus developed for briquetting at the S. M. Kirov Byelorussian Institute of Wood Technology.

1128. MININ, A. N. Vlijanie vlažnosti opilok v moment pressovanija na svojstva briketov. [**The influence of the moisture content of sawdust at the moment of pressing on briquette quality.**] *Lesn. Prom.* 1958 (8), (23–4). 1 ref. [Russ.russ.]

Investigates the strength, absorption, hygroscopicity, and dimensional stability of briquettes, and concludes that the optimum sawdust m.c. is 10–12%.

1129. SALZMAN, J. A., *et al.* **The water-holding capacity of wood chips as compared with common livestock beddings.** *Minn. For. Note* No. 69, 1958. pp. 2. 2 refs.

To obtain absorptive capacity equal to 1 lb. of straw would require ca. 3 lb. of Birch chips or 2 lb. of Red Pine, Aspen, or Jack Pine chips.

84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyard Practice

1130. **Wood preservation: treatments in buildings and other constructions.** *Wood* 23 (6), 1958 (245–66). 23 refs.

Comprises a collection of articles: Preservation in the 'wet' industries [tanneries, laundries, breweries, etc.]; Timber in ancient buildings; Fire retardant treatments; Laminated and glued assemblies: methods of preservation; Timber for farm use; Treating building timbers; and The preservation of timber against marine borers.

841. Wood Preservation

See also Nos. 978–80, 1075, 1154, 1161–4, 1166, 1172–4, 1183.

1131. REUSSE, W. Zur Frage der Holzimprägnierung mit radioaktiven Tränkstoffen. [**Wood preservation with radio-active preservatives.**] *Holz Roh- u. Werkstoff* 15 (3), 1957 (125–8). 9 refs. [G.g.e.] P.R.

A short review, drawing on experience obtained outside forestry [but cf. *F.A.* 18 No. 3462] and concluding that the radiation needed to destroy fungus and insect pests would render the treated timber, and a wide radius round it, highly dangerous to man and beast.

1132. HOF, T. Het conserveren van hout voor de tuinbouw. [**Preservation of wood for horticultural purposes.**] *Repr.* from *Mededelingen, Directeur van de Tuinbouw, 's-Gravenhage* No. 21, 1958 (17–26). [Du.e.] P.R.

Describes laboratory tests with 20 preparations (tar oil, organic solvent, aqueous solvent and undefined types) including tolerance tests with 8 fungi on agar media and softwood block tests with two, investigating also leachability, penetration by various methods of application, physical and chemical properties, etc. Taking into account leaching resistance and phytotoxicity (tested on lettuce), Cu naphthenates containing ca. 3% Cu, one PCP and two water-soluble preparations were considered the most suitable. With all, but particularly the last named, pressure treatment or soaking for ca. 7 days is thought to be necessary. Field tests are in progress. No proprietary names are given.

1133. BRAMHALL, G., and CONNERS, W. M. **Factors affecting the amount of naphthalene in condensate during boiling under vacuum in creosote.** *For. Prod. J.* 8 (7), 1958 (211–3).

Describes investigations in connexion with the creosoting of green wood by the Boulton process, where solids in the condensate, rich in naphthalene, may be troublesome. The % of naphthalene in the condensate was found to increase with increasing temperatures and decreasing pressure (i.e. higher vacuum).

1134. JONAS, G. Z. **The influence of various factors on the reduction of potassium dichromate in wood.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3811, 1958. pp. 10 + 5 gphs. 22 refs. Transl. by E. Pichler from *Holz Roh- u. Werkstoff* 14 (10), 1956 (403–7). [See *F.A.* 19 No. 2414.] Limited distribution.

1135. PACHOLIK, A. **Fixable wood preservative containing fluorine compounds, chromates and, if necessary, arsenic compounds.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3867, 1958. pp. 6. 3 refs. Transl. by J. Hardy from *Auslegeschrift, Deutsches Patentamt* No. 1019817, 1957. Limited distribution.

1136. SHIBAMOTO, T., and INOUE, Y. [**Studies on water-borne wood preservatives II. Determination of fluorine with thorium nitrate solution. III. On the significance of antimony fluoride double salt contained in the wood preservative, sodium fluoride-dinitrophenate.**] *J. Jap. Wood Res. Soc.* 4 (3), 1958 (106–17). 40 refs. [Jap.e.] P.R.

1137. SCHULZE, B. Wirkstoffverluste von Holzschutzmitteln durch Regen. [**Loss of efficiency of wood preservatives through rain.**] *Holz Roh- u. Werkstoff* 16 (6), 1958 (235–9). 1 ref. [G.g.e.] P.R.

Laboratory tests with Pine specimens impregnated with (*a*) a silicofluoride, (*b*) a bifluoride, and (*c*) U.S. salts (on an F basis) and subjected to immersion in water for various periods immediately or several days (up to 36) after treatment, indicated that potential losses through rain during building operations were greatest in (*a*) and least in (*c*), but, owing to higher initial F content, final retention in (*b*) often equalled or exceeded (*c*), and penetration was better. The use of a water-repellent as an after-treatment with (*b*) practically eliminated losses, but was expensive. [Cf. *F.A.* 18 No. 4667.]

1138. SCHOLLES, W. Über die pilz- und insektenwidrigen Eigenschaften von Naphtensäuren und Metallnaphtenaten als Wirkstoffe in Holzschutzmitteln. **[Fungicidal and insecticidal properties of naphthenic acids and metallic naphthenates used as the active principle in wood preservatives.]** *Holz Roh- u. Werkstoff* 15 (3), 1957 (128–37). 21 refs. [G.g.e.] P.R.

Surveys the literature and briefly describes the manufacture and application of Cu naphthenate according to USA standards. Extensive experiments (detailed) by the DESOWAG Chemie Gesellschaft, W. Germany, to determine the differences in the fungicidal and insecticidal efficacy of PCP and metallic naphthenate preservatives (rated equally effective by U.S. standards) showed that neither naphthenic acids, nor metallic naphthenates, particularly of Cu and Zn, possessed good fungicidal properties. These two groups of compounds were found to be even less effective against *Hylotrupes bajulus* and 'useless' against termites. Any toxic effect of metallic naphthenates is due solely to the metallic bond.

1139. WALKER, R. E., BRIDGER, G. L., and ARNOLD, L. K. (to Iowa State College Research Foundation, Inc.). **Method of impregnating wood with wood preserving oil.** *U.S. Patent* No. 2,799,597, 1957. pp. 2. From *abstr.* in *Prev. Deterior. Abstr.* 15 (9), 1958 (*Wood* 72). D.S.I.R.

Wood is first injected with an oily preservative and then with water containing a wetting agent; this solution, which may also contain a toxic or fire-retarding chemical, is immiscible with the preservative and forces it deeper into the wood. Wood thus impregnated shows improved penetration, distribution, and retention of the preservatives. Douglas Fir poles were treated in an oily solution of PCP at 150 lb./sq. in. and 150° F. to a retention of 6–7 lb./cu. ft. The oil was displaced with compressed air, then with the aqueous solution at 200° F. for ½ hr. at 150 lb./sq. in. and 5½ hr. at 50 lb. The aqueous solution was removed and the wood steamed and then subjected to a vacuum for 30 min. Incised groundline sapwood showed 99% penetration and non-incised midpoint sapwood 91%, with some heartwood penetration; comparable figures for the Lowry method were 89% and 82% without heartwood penetration.

1140. REDDING, L. W. **The resistance of various timbers to impregnation.** Forest Products Research Laboratory, Princes Risborough. 1958. pp. 46 + 3 plates.

Presents tables showing the absorption and penetration of creosote, for pressure and open-tank treatments, of some 22 softwoods and 120 hardwoods commonly used in Great Britain, and classifies the species (heartwood and sapwood separately) according to their permeability.

1141. VERRALL, A. F. **Absorption and penetration of preservatives applied to Southern Pine wood by dips or short-period soaks.** *Occ. Pap. Sth. For. Exp. Sta.* No. 157, 1957. pp. 31. 30 refs.

A full account of experiments carried out over a number of years. With dips or short-period soaks, liquids moved into Southern Pine wood mainly through the wood and ray tracheids. Resin ducts were penetrated for long distances beyond the generally treated wood, but with no evidence that the solution spread from the ducts to surrounding tissues. The absorption and penetration of water and light oils were found to vary with the character of the wood: e.g. there were significant and apparently inherent differences in treatability of samples from different trees; sapwood treated more readily than heartwood, and latewood than early wood; there were indications tha absorptions were inversely proportional to sp. gr. When treated at the same m.c., kiln-dried wood appeared to be more permeable to oil and less permeable to water, than air-dried wood. Both above and below the fibre-saturation point, absorptions were inversely proportional to the m.c. of the wood. Rough lumber absorbed 1·7 times as much oil as planed samples of the same size. Fungus infections (especially *Trichoderma* spp.) markedly affected [assisted] absorptions and penetrations. A high proportion of the total absorption occurred during the first seconds of immersion. The addition of water repellents to an oil solution significantly reduced both absorption and penetration, but the use of repellents greatly reduced decay hazard. The data indicate that little lateral penetration will result from these rapid treatments. Wood should be well below fibre-saturation point when treated. *From author's summary.*

1142. HATTORI, M. **Effect of incising on penetration of cresote in Japanese Cedar poles.** *For. Prod. J.* 8 (6), 1958 (27*A*–29*A*).

A report on Japanese experiments [cf. *F.A.* 17 No. 2108]. Incision increased penetration and uniformity of distribution in poles previously air-dried or conditioned by a steam-and-vacuum, or a boiling-under-vacuum (Boulton) process, particularly the last.

1143. GEWECKE, H. Die Frischimprägnierung von Masten aus Fichten- und Tannenholz nach dem Saftverdrängungsverfahren. **[The preservative treatment of green Spruce and Fir poles by the Boucherie process.]** *Holz Roh- u. Werkstoff* 15 (3), 1957 (119–24). 6 refs. [G.g.e.] P.R.

Describes, with some experimental data, improvements of the Boucherie process, viz. the trough-suction, pressure, and pile-suction processes, claimed to eliminate the two main disadvantages of the former, viz. the long impregnation period and the loss by drip from the top. *From author's summary.*

1144. BECKER, G. Neue Erkenntnisse über den Nachschutz hölzerner Leitungsmaste mit Salzen. **[After-treatment of wooden transmission poles with salts.]** *Elektrizitätswirtschaft, Frankfurt am Main* 56 (7), 1957 (207–13). [G.g.] P.R.

A report on investigations into the ground-line treatment of wooden poles by applying water-soluble salts under waterproof bandages. Studies of the movement in wood of water alone, showed Spruce to be more resistant than Pine to penetration by moisture from the surface, and to have a steeper moisture-content gradient from the periphery to

the centre. Water uptake from the surface of the pole is more important than penetration in the direction of the grain, either from the top or base. In 2-year trials in Göttingen to estimate the amount of precipitation coming into contact with poles, it was calculated that when an average of 50 litres/sq. m. of pole surface falls in precipitation, the surface exposed to the prevailing wind will receive ca. 100 litres/sq. m. When pastes containing (1) NaF and (2) U salts, were applied under waterproof bandages to poles that had originally been treated with creosote, $HgCl_2$ or UA salts, (1) penetrated better than (2). In Pine, penetration in a period of 2 months was ca. 35% greater than in Spruce, but values later evened out between the two species. In poles not treated previously, a wider and deeper area of the wood is affected in Pine than in Spruce. Previous treatment with creosote, $HgCl_2$ or UA salts retarded penetration, but, after several months, the amount of salts penetrating was the same as in poles not previously treated. Analysis of the fluoride content of poles after ground-line treatment showed that with (1) a deeper penetration is reached more quickly and concentrations at the periphery are consequently lowered more quickly, whereas with (2) high concentrations remain at the surface for a longer period.

1145. DALE, F. A. **Water-borne preservatives for fence posts—Part I.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 242, 1958 (1–3). 1 ref.

Describes a portable £350–500 Australian plant impregnating with fixed salts (Cu, Cr, As, Zn compounds) 200 posts/day and recovering its cost in 6 weeks. A tube extension can accommodate 8-ft. lengths. Among advantages over creosote are transport savings. Recommended pressure and dry salt loading for *Pinus radiata* are 50 lb./sq. ft. and 0·75 lb./cu. ft. [Cf. *F.A.* 19 No. 1068.]

1146. DALE, F. A., and BOWERS, E. A. **Water-borne preservatives for fence posts. Part II. The sap-replacement method.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 243, 1958 (1–4).

For those whose smaller requirements do not warrant the expense of the method described in the preceding abstract, the method of sap-replacement with Cu-Cr-arsenic is detailed. Any freshly cut Eucalypt with $\leq$ 0·5 in. sapwood and not subject to splitting is suitable. Other hardwoods and *Pinus radiata* may be suitable but have not yet been tested. A table shows the number of 6-ft. posts that can be treated, per gal. of solution, to a loading of 1 lb. dry salt/cu. ft. of sapwood, when diameters vary from 2, 3, . . 8 in. and for normal sapwood widths to 0·75 and 1·25 in., the solution strength being 14 lb. dry salt/40 gal. water (3½%).

1147. GÖHRE, K. Untersuchungen über die Imprägnierung nassen Grubenholzes mittels Trogtränkung im Heiss-Kalt- bzw. Kaltverfahren. [**The impregnation of green mining timber by open-tank processes.**] *Arch. Forstw.* 7 (3), 1958 (243–56). 5 refs. [G.g.russ.e.]

Green and half-dry barked round timber (20 cm. diam.), treated by open-tank methods with 15% of Dohnalit II (F base) was given extensive protection in 15 + 15 min. hot + cold dips for Pine and 1 + 2 hours for Spruce. Equally effective were cold dips in a higher concentration: one hour for green Pine and 8 for green Spruce. Uptake of preservative, as judged by depth of penetration, in Pine equalled, and in Spruce and Silver Fir apparently exceeded, that from pressure impregnation. Pressure impregnation of green half-dry timber in higher concentrations of preservatives showed great promise, e.g. Pine treated with 2% NaF showed very deep penetration 8 weeks after treatment.

1148. DALE, F. A., and ROSEL, A. **Project P.3. Sleeper investigations. Sub-project P.3–3. The preservation of *Pinus radiata* for rail sleepers in South Australia. Progress report No. 6. Sixth inspection 1956.** Division of Forest Products, C.S.I.R.O., Melbourne. 1958. pp. 11 + 5 tbls., 4 photos. Limited distribution.

Inspection after 20 years has shown that Pine sleepers treated with creosote or creosote plus furnace oil behave as well as the best Eucalypt sleepers in all except the most severe loading conditions. Waterborne preservatives ($ZnCl_2$ plus As_2O_3 or Tanalith U) have failed to give the necessary protection against splitting and weathering, but have given relatively high resistance to decay.

1149. BROESE VAN GROENOU, H., and BELLMANN, H. Zur Frage der Imprägnierung feuchter Buchenschwellen. [**Preservative treatment of green Beech sleepers.**] *Holz Roh- u. Werkstoff* 16 (6), 1958 (229–33). 28 refs. [G.g.e.] P.R.

Briefly discusses existing systems, including Boulton's (boiling in creosote under vacuum) and Taylor-Colquitt's (vapour drying) and recent modifications for Beech boards. The treatment here described for sleepers consists of 2–3 hours' immersion in hot creosote (final temperature 95–100°C.) under vacuum, followed by a single application of the Rüping process. Retentions are usually higher, but provided that final moisture content is ca. 35% and the temperature increase and vacuum gradual, checking is usually less than with air-dry sleepers.

842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies other than Fire

See also Nos. 962, 985, 1086, 1109.

1150. ERICKS, W. P. **A method for dimensional stabilization of wood and wood veneer.** *For. Prod. J.* 8 (7), 1958 (197–9). 4 refs.

Discusses the molecular structure of hydrocarbon compounds found to act as stabilizers for cellulose fibres and their mode of action, which consists, it is suggested, in a permanent increase in the cross-section of the cellulose molecule, and describes experiments (*a*) with small White Pine blocks soaked in, and (*b*) strips of thin Honduras Mahogany veneer pressure-treated with, various stabilizers (developed initially for paper) patented by the author under the name 'Stab-U-cell'. For (*a*) reduction of hygro-expansivity was 64–85% $\perp$ to main fibre direction, for (*b*) 45–70%.

1151. PISKAREV, V. A. Nekotorye svojstva pressovannoj drevesiny. **[Some properties of compressed wood.]** *Derev. Prom.* 7 (1), 1958 (15). 1 ref. [Russ.russ.] P.R.

Statistically designed investigations were made on the effect of the initial moisture content (10, 20, 30, 80 and 120%) of Birch wood before compression, on the density, and strength under compression || and static bending, after compression. The values for all three properties examined rose with increased original m.c. of the wood. An initial m.c. of 80% is recommended. Compression of wood of low initial m.c. causes micro-breakdown of structure, with a consequent reduction of strength.

844.1. Sap-staining and Mould Fungi

See also Nos. 1162, 1194.

1152. **Cause and prevention of blue stain in wood.** *Tech. Note U.S. For. Prod. Lab., Madison* No. 225, (rev.) 1958. pp. [4]. P.R. [Cf. *F.A.* 15 No. 1964.]

1153. GLASER, T., and SPŁAWA-NEYMAN, S. Badania nad czynnikami povodującymi kawowobrunatne przebarwienia sosnowego drewna tartacznego. **[Study of factors causing coffee-brown discoloration of Pine sawtimber.]** *Prace Inst. Tech. Drewna* 4 (2), 1958 (3–45). 16 refs. [Pol.russ.e.] P.R.

This discoloration was observed in 1954–55 mainly in sapwood along splits on faces, and where the bark had been removed at the mill and on logging sites (but not in the laboratory). The fungus mainly responsible was isolated and identified as *Discula brunneo-tingens* [cf. *F.A.* 17 No. 4510]. After 5 months' activity on wood in the laboratory no visible decay was observed, and tests showed little difference in impact strength from that of sound wood. Other fungi isolated were *Trichoderma lignorum* and *Stereum sanguinolentum*. Notes are given on the morphology and development of all 3 species. *S. sanguinolentum* decreased impact strength by ca. 40%. Laboratory tests showed that the most effective preservatives against these species were, in order of efficacy, nitrophenol, creosote and NaF. Higher concentrations were needed to check *S. sanguinolentum* than *D. brunneo-tingens*. Practical measures for avoiding discoloration, e.g. sawing before it develops and storing in water, are suggested. Data on preservative penetration and impact strength are from preliminary tests only; further research is needed.

1154. TUOVINEN, A. Koivutukkien suojauksesta värivikoja vastaan. **[Protecting Birch logs against discoloration.]** *Tied., Metsäteho, Helsinki* No. 142, 1958. pp. 4. [Fi.e.]

In the first series of experiments in 1955 on the protection of 1-m. butt logs, the butt ends were treated in June immediately, or 1 week after felling, and the top ends in July when the trees, after seasoning with crowns intact, were cut into lengths. Chemicals used were Basileum VS and Witoxyl-B 23, Dura-Texa and an experimental compound. The 200 logs were stored in the forest, on foundation timbers or on the ground, and were split and examined in August and September. Dura-Texa proved best, although its effect was very slight by September, and treatment immediately after felling gave slightly better results than that a week later. In the second series, long logs of Birch felled in winter were cut into 3- to 6-m. lengths, and then into 1-m. lengths, and treated in late March (with 2 Basileum VS preservatives) or early May (with a wide variety of preservatives). One-third of each group (60–90 logs) was stacked on the ground throughout the summer (*a*), ⅓ was bundled and stored in clean lake-water from 21 June (*b*), and ⅓ was bundled and stored in polluted water in a log pond from 10 July (*c*). Logs from (*b*) and (*c*) were split and examined in early September and those from (*a*) in August and September. Preservation was best in (*b*), then in (*c*), then in those from (*a*) examined in August, those from (*a*) examined in September being least well preserved. Results show that preservative treatment of winter-felled logs can be postponed until the ice thaws in the floating channels. Aino, Dura-Texa, Basileum Vs, Witoxyl-B 23, and the sulphate pitch of Enso-Gutzeit Osakeyhtiö were the most reliable of the preservatives tested, but results varied considerably. *From author's summary.*

1155. FOUGEROUSSE, M. Les altérations fongiques des bois frais en Afrique tropicale et plus particulierèment de l'Ilomba et du Limba. **[Fungus damage to freshly felled timber in tropical Africa, particularly to *Pycnanthus angolensis* and *Terminalia superba*.]** *Bois For. Trop.* No. 60, 1958 (41–56). [F.e.span.]

Gives a detailed account of the 'cow's tail' stain of *P. angolensis*, which is shown to be caused chiefly by *Ceratostomella* spp. which, in addition to discoloring the wood, are attractants to several species of Scolytidae. Trees can safely lie in the forest for 4 weeks after felling, provided that the butt end and any wounds in the bark are treated with preservative. Notes are also given on fungal infections of *Terminalia superba*, which are of less importance.

844.2. Wood-destroying Fungi

See also Nos. 705–21, 953, 1003, 1094, 1138.

1156. KOHLMEYER, J. Holzzerstörende Pilze im Meerwasser. **[Wood-destroying fungi in sea water.]** *Holz Roh- u. Werkstoff* 16 (6), 1958 (215–20). 23 refs. [G.g.e.] P.R.

Discusses morphology, physiology, the breakdown of cellulose, and symbiotic relationships with teredinids and gribbles as investigated at the marine laboratories at Dahlem. One Fungus Imperfectus, *Helicoma maritimum*, and one Ascomycete, *Peritrichospora integra*, were identified. [Cf. *F.A.* 19 No. 2402.]

1157. **Soft rot investigations.** *Rep. For. Prod. Res. Bd., Lond. 1957*, 1958 (28–9 + 1 plate).

For the first time, good growth of *Chaetomium globosum* and marked decay in softwoods have been obtained in the laboratory by pre-treating samples of Scots Pine sapwood with chlorine water. They thereby lost ca. 5% of their dry weight and another 16% after 6 weeks of fungal growth. In Beech, growth was best at ca. 29° C. Details of the experiments are given.

1158. BUTLER, G. M. **The development and behaviour of mycelial strands in *Merulius lacrymans* (Wulf.) Fr. II. Hyphal behaviour during strand formation.** *Ann. Bot., Lond.* 22 (86), 1958 (219–36). 15 refs. O.R.E.

Discusses, with illustrations, observations on a mycelium which had grown from a food base on to glass slides in sterile moist chambers. Cell division, with formation of clamp connexions, was restricted to the apical cells, and branch hyphae were present almost always in association with such clamps. [Cf. *F.A.* 19 No. 2463.] *From author's summary.*

1159. SHIMAZONO, H., SCHUBERT, W. J., and NORD, F. F. **Investigations on lignin and lignification. XX. The biosynthesis of methyl *p*-methoxycinnamate from specifically labelled *D*-glucose by *Lentinus lepideus*.** *J. Amer. chem. Soc.* 80 (8), 1958 (1992–4). O.R.S.

1160. SISON, B. C., JR., SCHUBERT, W. J., and NORD, F. F. **On the mechanism of enzyme action. LXV. A cellulolytic enzyme from the mold *Poria vaillantii*.** *Arch. Biochem.* 75 (1), 1958 (260–72). 19 refs. O.R.S.

1161. GERSONDE, M. Über die Giftempfindlichkeit verschiedener Stämme holzzerstörender Pilze. **[The susceptibility to poisons of strains of wood-destroying fungi.]** *Holz Roh- u. Werkstoff* 16 (6), 1958 (221–6). [G.g.e.] P.R.

Presents results of tests on strains of *Coniophora cerebella*, *Poria vaporaria*, *P. vaillantii*, *Merulius lacrymans*, *M. sylvester* and *Lentinus lepideus*, 26 in all, with 7 poisons, revealing great inter- and intra-specific differences, with the standard test strains generally near the middle. Experimental methods, differences between strains in morphology, wood-destroying capacity etc. are to be treated more fully in another paper. [Cf. *F.A.* 19 No. 2402.]

1162. SCHEFFER, T. C. **Control of decay and sap stain in logs and green lumber.** *Rep. U.S. For. Prod. Lab., Madison* No. 2107, 1958. pp. 13 + 10 photos, 4 tbls. 3 refs. P.R.

Practical instructions, with recommendations for preservative treatments (concentrations, quantities, costs etc.).

1163. **Prevention of deterioration in logs.** *Rep. For. Prod. Res. Bd., Lond. 1957*, 1958 (31).

Beech bolts with their ends and bark scrapes coated with gasworks tar were not found to be adequately protected against infection by fungi.

1164. KEINO, K., and TOGASHI, I. **[Studies on the behaviour of chemicals sprayed on the log (1). On the permeation of PCP and its salts into the tissue from the cut end.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 100, 1957 (83–93). 7 refs. [Jap.jap.e.*e.*]

[Cf. *F.A.* 13 No. 2541.] The chief results, when BHC (emulsion), PCP and its Na, Cu and Zn salts (emulsion, aqueous and kerosene solutions) were sprayed on the cross-cut ends of recently logged Pine (*P*) and Beech (*B*) at 400 c.c./sq. m., were, in terms of mm. penetrated, as follows: PCP 2% plus γ BHC 1% (as an emulsion), for *P* 9 and for *B* 8; (in kerosene) *P* 57 and *B* 40; substituting Na PCP 2% (aqueous) for the PCP (as an emulsion) for *P* 7 and for *B* 9. Raising the % of PCP or Na PCP to 5% gave 50% more penetration in both *P* and *B*. Raising the pH of the aqueous Na PCP from 8·8 to 10·4–10·8 (with NaOH and Na_2CO_3) gave 50% more penetration for *B* and 200% for *P*, this effect being nil in the mixture with BHC emulsions. In *P*, raising the temperature of the spray from 5° to $\gtrsim$ 25° C. increased penetration by 50%, and giving 5 times the dose increased it by $\gtrsim$ 20%.

1165. MARK, R., and ZUCKERMAN, B. M. **Reinforced plastics as protective coatings for wood.** *For. Prod. J.* 8 (7), 1958 (25*A*–26*A*).

To remove doubts as to the durability of wooden parts embedded in the hulls of plastic boats, blocks of Balsa wood, (*a*) bare, (*b*) encased in a fibrous glass mat and polyester, (*c*) as (*b*) but with holes drilled in the casing and resealed, and (*d*) coated with polyester only, were exposed to fungal attack (*Poria microspora* and *Lenzites saepiaria*) in accelerated decay conditions for 100–190 days. While (*a*) was seriously attacked, (*b*)–(*d*) remained unaffected. It was also found by culture tests that the chemicals used in common polyester and epoxy formulations were fungitoxic in varying degrees.

845.1. Marine Borers

See also No. 1156.

1166. BECKER, G. Holzzerstörende Tiere und Holzschutz im Meerwasser. **[Wood-destroying animals and wood preservation in sea water.]** *Holz Roh- u. Werkstoff* 16 (6), 1958 (204–15). 100 refs. [G.g.e.] P.R.

A review of their distribution, ecology (e.g. salt tolerance), nutrition, etc., including a report on recent research into the symbiosis of certain species with marine fungi, and of various preservatives—creosote, tar, insecticides, metallic salts etc.—and their specific effects. [Cf. *F.A.* 19 No. 2402.]

1167. ELTRINGHAM, S. K., and HOCKLEY, A. R. **Coexistence of three species of the wood-boring isopod *Limnoria* in Southampton Water.** *Nature, Lond.* 181 (4624), 1958 (1659–60). 1 ref.

Three species of *Limnoria* (*L. lignorum*, *L. quadripunctata* and *L. tripunctata*) have been found living together in piling and test blocks taken from Southampton Water. This is the first European record for *L. tripunctata*, which had previously been reported only from Central and North America.

845.2. Terrestrial Borers

See also Nos. 808–15, 1138.

1168. **Timber borers of common occurrence.** *Pamphl. For. Comm. N.S.W.* No. 18, 1957. pp. 15.

Descriptions of insects and their life cycles, conditions of attack, degree of damage, and control measures, for *Lyctus brunneus*, *Anobium punctatum*, and ambrosia beetles in general.

1169. SANTORO, F. H. Una nueva especie de la subfamilia Trogoxyloninae (Col. Lyctidae). **[A new species of the subfamily Trogoxyloninae.]** *Repr.* from *Revista de la Sociedad Entomológica*

Argentina, B. Aires 18, 1955 (1956), (45–8). 8 refs. [Span.]

Describes *Trogoxylon ingae*, a new species found in sapwood of *Inga uruguensis* in Buenos Aires.

1170. SANTORO, F. H. Nuevo líctido (Coleopt.) para la fauna argentina *Phyllyctus gounellei* (Grouv.) Lesne. Redescripción y primeros datos biológicos. **[A new Lyctus beetle in the Argentine fauna, *P. gounellei*. A fresh description and biological data.]** *Repr.* from *Revista de la Sociedad Entomológica Argentina, Buenos Aires* 19, 1956 (1957), (69–71). [Span.]

In 1954, specimens of *P. gounellei* were found for the first time in Argentina in cut branches of *Melia azedarach* in Santa Fé province. A description is given with notes on life history and biology.

1171. **House longhorn beetle (*Hylotrupes bajulus*). Moisture relationships.** *Rep. For. Prod. Res. Bd., Lond. 1957*, 1958 (34).

In further work on the effect of wood moisture content on its suitability for larval development, newly labelled larvae that were inserted into the transverse section of disks of Scots Pine sapwood conditioned to 10% m.c. and maintained at 25° C. did not develop, but larvae introduced into wood of ca. 27% m.c. and left at the same temperature grew in 43 weeks to > 400 mg. in weight. Considerable variations in larval weight noted in the same sample are attributed to differences in the nutritional value of parts of the wood. Preliminary results are also given of an investigation into the effect of steaming on the liability of timber to attack. Sapwood of freshly barked Scots Pine was steamed at atmospheric pressure for 8–16 hours. Egg larvae were then introduced and the wood kept at 25° C. and 75% relative humidity. After a year, larvae from samples steamed for 8 hours weighed only 0·5–1·0 mg. vs. 31–98 mg. for controls.

1172. AUGSBURG, E. P. Praktische Erfahrungen über die Anwendung fluorhaltiger Holzschutzmittel in der Hausbockbekämpfung. **[The use of F compounds in the control of *Hylotrupes bajulus*.]** *Holz Roh- u. Werkstoff* 16 (6), 1958 (233–5). [G.g.e.] P.R.

Describes tests on 30 roof structures, applying 4 [unspecified] F preparations by repeated pressure spraying. To obtain a desired penetration of 15 mm. in sapwood after 90 days, ca. 120 g. solid preservative/sq. m. was thought advisable for bare wood, and ca. 150 g. for wood from which a lime wash had to be removed. Temperatures < 0° C. somewhat reduced and retarded penetration, which continued to increase throughout an observation period of nearly 3 years.

1173. WHALLEY, P. E. S. **The use of dieldrin for control of carpenter bees (*Xylocopa* sp.).** *E. Afr. agric. J.* 24 (1), 1958 (16). 1 ref.

The 12 × 1-in. tunnels of these bees (6 species named) seriously affect the strength of the unpainted rafters they prefer, > 200 such tunnels occurring in the rafters of each of two houses treated. Spraying with dieldrin 1% wettable powder (2 gal., costing 8*s.*, suffice to treat the rafters of one house) resulted in kills into the 10th month. With strengths of 0·25 and 0·5%, new borings were found in 3–4 and 6 months respectively.

1174. SINREICH, A. Ergebnisse eines Versuches mit Forst-Viton-Ölkonzentrat in Niederösterreich. **[Tests in Lower Austria with Forst-Viton [BHC] oil concentrate.]** *Allg. Forstztg.* 69 (15/16), 1958 (196–8). [G.g.]

Describes tests on 64 felled stems of Spruce, Silver Fir, Scots Pine and Oak, stored either on sunny or on shaded sites, including quantities of preservative required, insects and fungi found, etc. Forst-Viton in diesel oil [concentrations not given] prevented barkbeetle attack or killed beetles in the early stages. Diesel oil alone was temporarily effective on Spruce and Fir, and on thin-barked Fir on sunny sites killed beetles below the bark. Chief species attacking controls were: *Ips typographus*, *Xyloterus lineatus* and *Hylurgops palliatus* (Spruce), *Cryphalus piceae* and *Pissodes piceae* (Fir), *Myelophilus piniperda* and *M. minor* (Pine), and *Clytus* and *Rhagium* spp. (Oak).

1175. JANSSEN, W. P. **Ambrosia beetle damage in lumber.** *B.C. Lumberm.* 42 (8), 1958 (10 . . . 14). 2 refs.

Reports the quality and value degrade caused by *Trypodendron cavifrons* and *Gnathotrichus sulcatus*, in 4 logs each of (*a*) Douglas Fir and (*b*) Western Hemlock according to List 15 (domestic) and R-list (export market). Infestations were 15–30 holes/sq. ft. In (*a*) 9·2% was degraded for the domestic and 43·6 for the export market, the figures for (*b*) being 18·1 and 53·5 respectively.

845.3. Termites

See also Nos. 81, 1024, 1138.

1176. WOLCOTT, G. N. **Inherent natural resistance of woods to the attack of the West Indian dry-wood termite, *Cryptotermes brevis* Walker.** *Journal of Agriculture of the University of Puerto Rico, Rio Piedras* 41 (4), 1957 (259–311). 12 refs. [E.e.span.] I.M.I.

Summarizes and discusses tests begun in 1923, in some cases modifying resistance ratings published in an earlier list [cf. *F.A.* 12 No. 3060]. The present list contains ca. 300 species with some notes on nomenclature and taxonomy. Natural resistance was absent in species from both the northern and southern temperate zones, rare in subtropical species but not infrequent in the tropical species.

1177. GAY, F. J. **Termite attack on Radiata Pine timber.** *Aust. For.* 21 (2), 1957 (86–91). 1 ref.

Service records and field and laboratory tests show that *Pinus radiata* is not very susceptible to attack by *Nasutitermes exitiosus*, but is readily attacked by species of *Coptotermes*, *Heterotermes* and *Schedorhinotermes*, particularly by *C. lacteus*.

1178. SCHULTZE-DEWITZ, G. Vergleichende Untersuchungen der natürlichen Frassresistenz einiger einheimischer Kernholzarten unter Verwendung von *Calotermes flavicollis* Fabr. und *Reticulitermes lucifugus* Rossi als Versuchstiere. **[The**

natural resistance to termites of some native heartwood species, with *C. flavicollis* and *R. lucifugus* as test animals.] *Holz Roh- u. Werkstoff* 16 (7), 1958 (248–51). 11 refs. [G.g.e.] P.R.

Heartwood (h.w.) and sapwood (s.w.) of 3 softwood and 7 hardwood species were exposed separately to attack by the termites. Results, shown in graphs, include the following: Susceptibility of h.w. to attack by both species was lowest in Pine and *Quercus sessiliflora* and highest in Larch, Ash and *Populus* × *canadensis*. *Q. sessiliflora* proved more resistant to attack than *Q. robur* or *Q. borealis*. Susceptibility of s.w. was very much more variable; both termite species preferred the h.w. of Poplar to the s.w. When s.w. damage was expressed as a % of that of h.w., the mean figures were 110% for *C. flavicollis* and 140·5% for *R. lucifugus*. *C. flavicollis* consumed 6·1 times as much s.w. as *R. lucifugus* (36·2% and 5·9%) and 7·8 times as much h.w. (32·9 and 4·2%). Mortality of *R. lucifugus* in s.w. was roughly inversely proportional to the amount eaten; the relationship in h.w. was much less clear.

847. Drying (Seasoning)

See also Nos. 968, 972, 977, 1029, 1107–8, 1267.

1179. RICHARDS, E. G. **Seasoning in the forest.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (83).

Equal numbers of Sitka Spruce poles of 3, 4, and 5 in. q.g.b.h. were felled at quarterly intervals from winter 1952 to July 1953, and left lying, supported on slash, on the forest floor. Half of each lot were barked and the rest left unbarked. The principal effects observed were the favourable effect of barking on rate of seasoning, and the faster rate of drying of poles felled in spring or early summer.

1180. NOBUKUNI, M. **[The dry weight of Buna (*Fagus crenata* Blume) sleepers and a method of controlling it.]** *Wood Ind., Tokyo* 13 (8), 1958 (21–5). 6 refs. [Jap.e.] P.R.

The author proposes the random sampling of one sleeper per layer of sleepers in a stack, to determine the mean dry weight in air seasoning; this method gave a maximum error of 1–2 kg. per sleeper. The experimental error in stacking 9 × 9 was found to be half that of stacking 1 × 9, the former also giving quicker and more even drying; graphs showing variations in weight (i.e. of moisture content) at various levels in the stack are presented. The less the weight of (i.e. the drier) the stack, the smaller was the S.D. of moisture-content determinations.

1181. PAGE, R. H., and CARTER, R. M. **Variations of moisture content of air-seasoned Southern Pine lumber in Georgia.** *For. Prod. J.* 8 (6), 1958 (15*A*–18*A*).

The study [cf. *F.A.* 19 No. 2465] indicated that while mean m.c. was generally < 20% after 3 weeks, uniformity was poor. It was greatest in flat stacks, and least in end stacks, with excessive m.c.'s in the crosslaps of cribs. Degrade, however, was greatest in flat-stacked and smallest in package-stacked timber.

1182. **Tests on the effect of air speed on drying rate.** *Rep. For. Prod. Res. Bd., Lond. 1957*, 1958 (10).

Two main series of tests showed that, at an air speed of 3 ft./sec., the time lag at the centre of an 8-ft. stack of 1-in.-thick Beech compared with that at the two sides, in drying from green to about 12% m.c., was small. A speed of 4 ft./sec. should prove adequate, provided that the direction of air circulation is frequently reversed. Test results from rapid drying of 1-in. Scots Pine at high temperatures were adversely affected by unexpectedly large inherent variations in drying properties, but an optimum speed of ca. 5 ft./sec. was indicated.

1183. HUFFMAN, J. B. **Kiln drying of Southern hardwood crossties.** *For. Prod. J.* 8 (6), 1958 (165–72). 13 refs.

Briefly describes laboratory tests with Red and Black Gum (*Liriodendron styraciflua* and *Nyssa sylvatica*) and, more fully, industrial tests with Gum, Elm, Hickory, Beech and Red Oak sleepers of varying heartwood content. Drying for 3 days at dry-bulb 230° F. was generally satisfactory as a preparation for pressure treatment with creosote, though for some species drying and preserving schedules would need modification. Seasoning defects were generally less than with air drying.

1184. BYVŠIH, M. D. Avtomat dlja suški tarnoj doščečki. **[An automatic drier for box shooks.]** *Derev. Prom.* 6 (10), 1957 (5–6). [Russ.] P.R.

An illustrated account of the ASD-1 conveyor-type kiln, designed by CNIIMOD. It deals with 3600 shooks/hr. Smokeless combustion gases at 250–300° C. are used as the drying agent.

1185. SMIRDIN, P. M. Režimy suški bukovyh kolodočnyh bolvanok. **[Drying schedules for Beech last blanks.]** *Derev. Prom.* 6 (4), 1957 (14–5). [Russ.] P.R.

Briefly describes investigations on 6 drying schedules for blanks 358 × 150 × 108 mm. and presents (in a table and a graph) details of the most successful.

1186. LEONT'EV, N. L., *et al.* Vlijanie vysokotemperaturnoj suški drevesiny sosny na ee fiziko-mehaničeskie svojstva. **[The influence of high temperature drying on the physical and mechanical properties of Scots Pine timber.]** *Derev. Prom.* 6 (6), 1957 (3–6). 1 ref. [Russ.] P.R.

[Cf. *F.A.* 19 No. 3584.] Two experimental drying schedules using initial (minimum) temperatures of 85° and 90°, and final (maximum) temperatures of 120° and 135° C. respectively, were used with Scots Pine boards 25, 40 and 60 mm. thick, and of various widths and lengths. The original m.c. of the wood was 56·8–88·3%. Compared with conventional drying, the duration of drying was reduced by a factor of 2·6–3·5. The results of measurements of density, the coefficients of shrinkage in the radial and tangential directions, compression ||, specific work in impact bending, and shear || are statistically analysed and tabulated. Evaluation of the results leads to the conclusion that both of these drying schedules are suitable for practical use.

1187. LEONT'EV, N. L., *et al.* **Influence of high-temperature drying schedules on the physical and mechanical properties of wood.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3800, 1958. pp. 6. Transl. by M. Slade from *Derev. Prom.* 5 (10), 1956 (3–5). [See *F.A.* 19 No. 3584.] Limited distribution.

1188. KRECHETOV [KREČETOV], I. V., and TSAREV [CAREV], B. S. **Wood drying in superheated steam.** *Transl. Commonw. sci. industr. Res. Organ. Aust.* No. 3673, 1958. pp. 8 + 1 gph., 1 photo. 7 refs. Transl. by M. Slade from *Derev. Prom.* 4 (12), 1955 (9–12). [See *F.A.* 18 No. 1087.] Limited distribution.

848. Timberyard Practice. Handling and Storage of Timber

See also Nos. 563–4, 922, 1050, 1154, 1162–4.

1189. TAUBER, B. A. Vibracionnye grejfernye mehanizmy dlja pogruzki lesa. [**Vibrating grabs for loading timber.**] *Lesn. Prom.* 1957 (8), (12–4). [Russ.]

Describes two Russian-made grabs, timber capacity 0·75 and 5 cu.m., which are used on cranes for loading round wood. The jaws of the grabs are vibrated electrically, which improves penetration into the stack.

1190. KUZNECOV, N. D. Ryčažnyj brevnosbrasyvatel' dlja ambarnyh lesotasok. [**A lever-type log ejector for conveyors in log depôts.**] *Derev. Prom.* 6 (6), 1957 (16). [Russ.] P.R.

An illustrated description of the device, used on chain conveyors.

85. Grading of Wood and Wood Products

851. Timber Quality in General

1191. HEISKANEN, V. Raudus- ja hieskoivun laatu eri kasvupaikoilla. [**Quality of the Common Birch and the White Birch on different sites.**] *Commun. Inst. for. Fenn.* 48 (6), 1957 (1958). pp. 99. 78 refs. [Fi.e.*e.*]

The study was made on 3718 trees on 171 sample plots distributed throughout Finland, Birch being classified as (*a*) Common Birch (*Betula verrucosa*) and (*b*) White Birch (*B. pubescens*). In the *Oxalis-Myrtillus* type (OMT) the % of (*a*) was 62·8, in the *Myrtillus* type (MT) 82·2, and on drained wet peatlands only 11·3. Diameters, in all age classes of both species, were greatest on OMT, slightly less on MT and least on drained wet peatlands; diameter of (*a*) on all sites and in all age classes was clearly greater than that of (*b*). A detailed study was made of various defects (branchiness, knots, crookedness, cankers, decay, etc.) with particular reference to use as veneer, grading of veneer logs, and distribution of assortments. In all respects the comparison confirmed the superiority of (*a*) to (*b*), and of Birch grown on OMT or MT sites to that grown on drained wet peatland.

852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 645, 949–50, 977, 1062, 1067, 1074, 1213.

1192. SCHULZ, H. Merkmale überwachsener Holzfehler in der Baumrinde. [**Indicators of overgrown timber defects in the bark of trees.**] *Holz-Zbl.* 84 (71; 80), 1958 (919–21; 1045–6). 22 refs. [G.g.]

Discusses and illustrates chiefly the outward appearance of knots (relations of size and shape of scar to size and depth of knots) but also other wounds, frost cracks, spiral growth or figured grain, of numerous species. [Cf. *F.A.* 18 Nos. 2249, 3404.]

1193. ELLIOTT, G. K. **Spiral grain in second-growth Douglas Fir and Western Hemlock.** *For. Prod. J.* 8 (7), 1958 (205–11). 7 refs.

A study based on analysis of disks taken at b.h. from 18 Douglas Fir and 18 Western Hemlock stems aged ca. 60 years, on 3 British Columbia coastal forest sample plots. Within wide variations, a general pattern of an initial left-hand spiral, first increasing then decreasing with age and later turning into a right-hand spiral, emerged for both species. Spiral growth was most pronounced on the poorest sites.

1194. STUTZ, R. F., and STOUT, A. W. **The nature of chemical brown stains in lumber from the Western Pines.** *Abstr.* in *Plant Physiol.* 32 (Suppl.), 1957 (xiii). O.R.E.

It was found that the type of stain restricted to the sapwood of old pond-stored logs of *Pinus ponderosa*, *P. lambertiana* and *P. monticola* is caused by a micro-organism that acts mainly on the ray cells. The presence of these bacteria is first indicated by a sour smell from the green lumber and a tannin-like pigment which may be found on kiln drying. The brown stain found in both sapwood and heartwood from freshly cut or old pond logs is, however, caused by an enzyme system present in the wood acting on naturally occurring substrates. It is dependent on water and O for its action, forming a partly water-soluble colourless precursor which may be present in air-dried lumber. The enzyme is inactivated by heating for 10 minutes at 70°C.

1195. VINCENT, A. J. **A symposium on brittle heart in Malayan trees.** *Malay. Forester* 21 (2), 1958 (71–84).

Lists the papers read, and summarizes the discussion, at a symposium held at Kepong, 16 Dec. 1957. Summaries are given of 3 papers: A constructional use for timber containing brittle heart (*H. J. Burgess*); Brittle heart in *Shorea leprosula* and *S. parvifolia* (*P. K. B. Menon*); The habitat of *Shorea* spp. and its possible association with the grade of timber produced (*J. Wyatt-Smith*).

1196. VINCENT, A. J. **A further analysis of the extent of brittle heart.** *Malay. Forester* 21 (2), 1958 (108–12).

[Cf. *F.A.* 18 No. 4735.] Owing to doubts as to the statistical adequacy of the material available no definite conclusions were reached, but the new data appear to support the former conclusions.

1197. CROSBIE, A. J., and HOTSON, J. M. **Mineral deposits in *Afzelia africana*.** *Emp. For. Rev.* 37 (2), 1958 (233–6). 5 refs.

Describes the occurrence of deposits of $CaCO_3$ with small amounts of $MgCO_3$ within radial cracks or shakes and occasionally between growth rings in logs of *A. africana*. These hard deposits interfere with sawing and in some cases logs had to be discarded. Studies are being continued to determine the relationship between these deposits and physical and nutrient conditions of the soil.

853. Grading of Wood in the Rough

See Nos. 218, 850, 955.

854. Grading of Converted Timber

See Nos. 218, 1095, 1106.

86. Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood

861. Pulp and Paper Manufacture. Textile and Other Cellulose Derivatives

See also Nos. 218, 376, 499, 579, 941, 999, 1002.

1198. KIKUCHI, H. **[Literature of the pulping of wood from research in Japan.]** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 103, 1957 (121–52). 417 refs. [Jap.]

Tabulates, under authors, 417 items with title, species used, process examined, bibliographical citation etc., published between 1925 and 1956.

1199. BRECHT, W., and VOLK, W. **Instrumental procedures of the fibre-length measuring technique.** British Paper and Board Industry Research Association, Kenley. 1958. pp. 7. 10 refs. Transl. by E. A. M. Thomson from *Papier, Darmstadt* 12 (9/10), 1958 (196).

Gives details of some instruments for measuring length of fibres in paper pulp from a magnified image and recording results electrically, including one developed in the Papermaking Institute.

1200. PRICE, F. A. **Thurso, new pulp mill for Eastern Canada.** *Pulp Paper Mag. Can.* 59 (6), 1958 (111–48).

Detailed description of a pulp mill integrated with a sawmill and veneer plant, drawing on an area of 800 sq. miles (White Pine, Spruce, Balsam, Birch, Oak, Ash, Elm and Basswood, 30% being softwoods), in Quebec. It covers policy, yield, markets, logging, construction, plan, flow diagrams, wood handling, pulping and bleaching, drying, finishing, dispatch, recovery, power plant and re-causticizing.

1201. BELL, G. E. **A pulp chip program to utilize sawmill residue.** *F.P.L. tech. Note For. Prod. Lab., Can.* No. 7, 1958. pp. 14. 6 refs.

Gives some basic data from which to estimate available supplies of potential pulpwood chips in Canadian sawmill residues, e.g. chip yield per 1000 bd. ft. by log-diameter classes, and sp. gr. and weight per cu. ft. of some Eastern Canadian species, together with notes on costs, prices, handling, transport etc., of chips.

1202. STEWART, D. L. **Mechanical pulp from sawdust.** *Pulp Paper Mag. Can.* 59 (7), 1958 (125–8).

Results of a comparison of 4 operational procedures and the characteristics of the resulting pulp with those of standard groundwood pulp are tabulated. The sample used was a run-of-the-mill mixture consisting of 45, 22 and 18% respectively of headsaw, edger and slasher dust plus 15% of chip-screen fines. *Tsuga heterophylla* was the main species, with some *Picea sitchensis*, *Abies* spp. and Douglas Fir. Sawdust can be satisfactorily pulped in a disk refiner to give a pulp resembling, but slightly weaker than, groundwood. Pretreatments to improve strength are discussed.

1203. BRANDAL, J., and JOHANNESSEN, K. **Slipmasse av vått og tørt virke. [Groundwood pulp from wet and dry pulpwood.]** *Norsk Skogind.* 12 (7), 1958 (262–71). 11 refs. [Nor.e.] P.R.

Pulp made from the logs of submerged parts of bundles of Spruce which had been under water for ca. 5 months and had a mean m.c. of 68% showed a significantly higher content of long fibres, greater strength properties, greater brightness, and less fines than pulp made from logs that had been above the surface (mean m.c. 38%). *From authors' summary.*

1204. STONE, J. E., and NICKERSON, L. F. **The pulping of mechanically treated wood 1. Crushed softwoods.** *Pulp Paper Mag. Can.* 59 (6), 1958 (165–73). 24 refs.

White Spruce [*P. glauca*] and Tamarack [*Larix laricina*] were crushed (*a*) $\parallel$ to the grain, at 4000 lb./sq. in. and (*b*) $\perp$ at 4000 and 14,000 lb., and cooked in the same digester, separated in baskets, with uncrushed controls. The Spruce was pulped to 59% yield in sulphite liquors of pH 2·0, 5, and 8·5 and by the kraft process. The chemical and physical properties of the pulps are tabulated, with photomicrographs of the crushed wood and the resultant pulps. The rate of pulping and chemical composition were unaffected, but (*a*) was much more detrimental to pulp quality than (*b*) and the degradation (varying with the process) was greatest in the acid sulphite, less in the bisulphite, and least in the kraft and neutral sulphite liquors.

1205. DU, H.-T. **[Studies on the alkaline pulping of Bamboo.]** *Bull. Taiwan For. Res. Inst.* No. 47, 1957. pp. 12. 7 refs. [Chin.chin.e.*e.*]

Phyllostachys makinoi was pulped with different variables (time, sulphidity, etc.) and 6 species were pulped by the Raitt process, giving yields of 41–47%. Fibre lengths were generally considerably longer than for hardwoods, *Sinocalamus latiflorus* having the longest fibres.

1206. STEVENS, R. H. **Bamboo or wood.** *Southern Pulp & Paper Manufacturer* 21 (3), 1958 (93–4, 108). From *abstr.* in *Chem. Abstr.* 52 (10), 1958 (8547). P.R.

Work at the Harty Foundation has shown that Bamboos can be pulped readily, with less chemical and power than wood, by the kraft and a 2-stage alkali process. Fresh culms and those cut for a year and protected against insect damage gave equally good results. Chemical composition of the

culms and of the pulps was similar to that of pulpwood species and wood pulps respectively. Only minor differences were found between pulps of 21 Bamboo species. The fibres are shorter than those of conifers and longer than those of hardwoods, and narrower than wood fibres used in papermaking. Properties of the pulps and papers are discussed.

1207. VOIRET, E. G. **[1] New pulping process. [2] Pulps for book and printing papers from deciduous wood.** *Papeterie, Paris* 79, 1957 (763; 835–43). [F.?] From *abstr.* in *Chem. Abstr.* 52 (14), 1958 (12397). P.R.

[1] Chips from a mixture of hardwoods cooked with chemicals at 170° C. for 30 min. followed by mechanical defibration and beating, gave uniform and bright pulp in 80–90% yield. [2] The properties of pulp obtained from a mixture of Beech, Birch, Poplar, Lime, Ash and hemp by the above process are discussed.

1208. HUNG, C.-M. **[Experiments on the pulping of *Trema orientalis* (L.) Bl.]** *Bull. Taiwan For. Res. Inst.* No. 46, 1956. pp. 5. 7 refs. [Chin.e.*e.*]

Presents tabulated data on the chemical composition of *T. orientalis* and yields by different pulping methods. A low-concentration NH_4HSO_3 process gave a particularly high yield (65%).

1209. PERILÄ, O. Koivusulfiittiselluloosan uuteaineista I. Koivun kaato-ajan vaikutus eetteriuutteen määrään. **[The extractives of Birch sulphite pulp. I. Ether extract content and felling date.]** *Pap. ja Puu* 40 (4*a*), 1958 (159–64). 15 refs. [Fi.fi.e.] P.R.

The composition of the ether extracts of pulp from *Betula verrucosa* felled at 2-monthly intervals was determined. Extractive contents of pulp from both fresh and seasoned chips were at their highest in March and at their lowest in July, suggesting that Birch for sulphite pulp should be felled in summer. *From author's summary.*

1210. PERILÄ, O. Koivusulfiittiselluloosan uuteaineista II. Valkaisu. **[The extractives of Birch sulphite pulp. II. Bleaching.]** *Pap. ja Puu* 40 (6), 1958 (335–8, 340). 8 refs. [Fi.e.] P.R.

Presents the results of experiments on the effect of different bleaching treatments on the extractives obtained from freshly felled and from stored Birch chips.

1211. WATSON, A. J., DADSWELL, H. E., and STEWART, C. M. **The process of fibre separation. Part 2: cold soda pulps from *Eucalyptus regnans*.** *APPITA, Melbourne* 11 (6), 1958 (145–55). 8 refs.

[Cf. *F.A.* 19 No. 4979.] The influence of some of the variables on the properties of cold soda semi-chemical pulps was investigated. Although complete penetration by the alkali was unnecessary to produce satisfactory pulps, those from fully penetrated chips showed the best strength development when beaten. More rapid penetration was obtained with water-soaked chips or higher temperatures. Reduction of chip size gave better penetration but had little effect on pulp quality. Pulp yields were similar for all cold soda treatments, and lignin and pentosan contents of the pulps showed little variations except for the most severe alkali treatments. It is suggested that the alkali treatment weakens the chemical bonds associated with fibre adhesion, and this factor, rather than the small amount of lignin removed, enables the chips to be defibred mechanically without undue fibre damage. *From authors' summary.*

1212. MAŠIREVIĆ, Đ. Osobine i upotrebljivost naše topole za proizvodnju celuloze. II. Jasika. **[The properties and possibility of using Jugoslavian Poplars for cellulose production. II. *Populus tremula*.]** *Topola, Beograd* 1 (2), 1957 (93–107). 3 refs. [Serb.g.]

Analyses were made of fibre length and the content and chemical composition of cellulose in Aspen, 14, 26 and 31 years old, from Bosnia. Fibre length averaged 0·94–1·03 mm. Data are given on the mechanical properties of the cellulose after sulphate cooking. Its use in the pulp industry is recommended.

1213. CLERMONT, L. P., and BENDER, F. **The chemical composition and pulping characteristics of normal and tension wood of Aspen Poplar and White Elm.** *Pulp Paper Mag. Can.* 59 (7), 1958 (139–43). 7 refs.

The normal and tension woods of *Populus tremuloides* and *Ulmus americana* (located by staining microscope slides of cross-sections taken along 8 evenly spaced radii) were separated, analysed, and pulped by the neutral sulphite semi-chemical process. Higher yields of pulps with strength properties at least as good, and in some instances better, were got from the tension woods. No large differences were found in the chemical composition of tension and normal wood (data tabulated).

1214. BUIJTENEN, J. P. VAN, JORANSON, P. N., and EINSPAHR, D. W. **Diploid versus triploid Aspen as pulpwood sources with reference to growth, chemical, physical and pulping differences.** *Tappi* 41 (4), 1958 (170–5). 6 refs. P.R.

Wild triploid Aspens (*Populus tremuloides*), discovered in the course of the project described, are believed to be the first in N. America, and are stated to display some desirable pulpwood characteristics. As in Swedish triploids, increased cell size has been found to be an associated condition. Fibre tracheids were 26% longer and 10% wider than in diploids, with little or no difference in wall thickness. The mature wild triploid stems studied increased more rapidly in volume. Further investigations on 5 diploid and 5 triploid stems from the same stand (Bruce Crossing, Mich.) included physical and chemical tests and evaluations of kraft pulps, the results being tabulated. In the triploids, sp. gr. was 6% higher, cellulose content 3% higher, lignin 3% lower and the permanganate number also lower than in the diploids. The tear factor was significantly higher and apparent density significantly lower in triploids. There was evidence that inherent fibre strength was a major factor influencing both tensile strength and bursting strength. These findings are considered to be of value for the improvement of Aspen as a source of pulpwood, and

as a basis for further studies to distinguish genetic and environmental effects. *From authors' summary.*

1215. POLLOCK, F. E. **Qualitative tree improvement for dissolving pulp production.** *Tappi* 41 (4), 1958 (148–50). P.R.

While the ideal wood fibre should contain a minimum of non-cellulosic substances, it is obvious that no single set of ideals can be formulated for wood used for dissolving pulps. Some desirable physical and chemical properties are, however, discussed as a guide to the tree breeder.

862. Composite Materials made Wholly or Partly of Woody Matter

See also No. 996.

1216. MARKWARDT, L. J. **Report on progress in development of testing methods for fiberboards.** *Rep. U.S. For. Prod. Lab., Madison* No. 2105, 1958. pp. 47. 9 refs. P.R.

Describes methods, apparatus, and results of testing hardness, nail and screw withdrawal, compression ∥ and ⊥ to faces, shear strength ∥ and ⊥ to plane of board, glue-line shear, impact, indentation and puncture resistance, abrasion resistance, dimensional stability, and durability of fibreboards for interior use. (N.B. 'fibreboard' is here used to include chipboard.)

1217. KLAUDITZ, W., and GRÜNEWALD, W. Stand und Entwicklung der Produktion und des Rohholzverbrauchs der Holzspanplattenindustrie in der Bundesrepublik. **[The state and development of production and wood consumption of the W. German chipboard industry.]** *Holz-Zbl.* 84 (88), 1958 (1131–3). 6 refs. [G.]

Covers industrial structure, productivity, products, processes, markets etc., and analysis of raw materials, of which ca. 36% is industrial waste wood. Of the German or imported pulpwood and fuelwood used, an increasing % is hardwood, chiefly Beech, Birch and Poplar and, recently, Oak.

1218. ŽUMER, L. Plošče v lesni industriji. **[Building boards in the wood industry.]** *Zborn. Inst. gozd. lesn. Gospod. Sloven.* No. 2, 1957 (5–54). 8 refs. [Sloven.e.e.]

The technological processes in the manufacture of plywood, fibre-, particle- and sandwich-boards are described and data given on their use and production in Europe, and also the production of building boards in Jugoslavia for 10 years between 1939 and 1954. Possibilities of increasing production are discussed, especially by greater utilization of Beech instead of conifers.

1219. **Particle board, principal processes, market potential, uses and experience, economics, testing and evaluating.** *FPRS Wood Technology Series, Madison* No. 20, [1957?] pp. 48.

Reprints of 13 articles from *J. For. Prod. Res. Soc.* Vol. 4, and *For. Prod. J.*, Vols. 5 and 6, most of which were noticed in *F.A.* at the time.

1220. NARAYANAMURTI, D. **The influence of resin supply in the development of a particle board industry in under-developed countries.** *Comp. Wood* 4 (5), 1957 (79–88). 33 refs. P.R.

A paper presented at the International Consultation on Insulation Board, Hardboard and Particle Board, Geneva 1957. Discusses, with reference to India, the use of indigenous products for particle board, e.g. wood-waste from sawmills and plywood factories, and inferior tree species. Possible substitutes for urea-formaldehyde resins are adhesives from cashew-shell oil and tannin-formaldehyde. The establishment of a particle-board industry, even using imported resin, is considered economically feasible.

1221. MARIAN, J. E. **Adhesive and adhesion problems in particle board production.** *For. Prod. J.* 8 (6), 1958 (172–6). 13 refs.

A discussion, based on a review of fundamental research, of desirable glue properties, gluing conditions, and chip properties. The present trend is in the direction of chips with undamaged cellular surface structure (i.e. from slicing rather than crushing chippers) and distribution of the adhesive as a film rather than as droplets.

1222. OTA, M., and TSUTSUMI, J. **[Studies on particle board produced from planer shavings. I.]** *J. Jap. Wood Res. Soc.* 4 (3), 1958 (90–4). [Jap.e.] P.R.

Variations in pressing temperature in the range 120–160° C. were found to affect physical and mechanical properties, those pressed at 160° being of the poorest quality; there were no significant differences between those pressed at 120° and 140° but probably the former is the more suitable. Of various concentrations of urea resin in aqueous solution in the range 20–45% the 35 and 40% concentrations gave best results. A study of the combined effect of the two factors showed that a temperature of 120° and a concentration of 40% (or 35%) gave the best product. A significant positive relationship was found between hygroscopicity and thickness swelling.

1223. KLAUDITZ, W., and GRÜNEWALD, W. Untersuchungen über die Eignung von Eichenholz zur Herstellung von Holzspanplatten. **[The suitability of Oak wood for chipboard manufacture.]** *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 3, 1958 (123–6). [G.]

Experiments under laboratory and factory conditions have shown that Oak cordwood can be friction-barked without difficulty, and, when green, made into chips 0·2–0·3 mm. thick, provided that sharper knives are used than with diffuse-porous hardwoods. Boards were equal in strength to Beech chipboards of comparable density and resin content. Oak chips were also used successfully, alone or in mixtures, for the middle layers of 3-layer boards. Tests with Red Oak were also satisfactory.

1224. ENZENSBERGER, W. Aufbau und Eigenschaften von beschichteten Holzwerkstoffen. **[The structure and properties of chipboards or fibreboards with surface overlays.]** *Holz* 12 (1), 1958 (2–3). [G.] P.R.

Discusses terminology, raw materials, manufacture, properties and uses of boards consisting of several layers of synthetic-resin-impregnated papers (*Laminate*), resin-impregnated papers on hardboard or particle board (*beschichtete Platten*), and '*Laminate*' glued to hardboard or blockboard (*kombinierte Platten*).

1225. **Hardboard. Testing and evaluating, processes, gluing, economics.** *FPRS Wood Technology Series, Madison* No. 21, [1957?] pp. 48. 6 refs.

Reprints of 15 articles from *J. For. Prod. Res. Soc.* Vol. 4, and *For. Prod. J.*, Vols. 5 and 6, some of which were noticed in *F.A.* at the time.

1226. KOLLMANN, F. Eigenschaftsstreuungen bei Holzfaser-Hartplatten. [**Variability in the properties of hardboards.**] *Holz Roh- u. Werkstoff* 15 (6), 1957 (247–52). [G.g.e.] P.R.

Sample boards were cut up according to DIN 52352, and the bending strength of the best pieces was measured (shown in histograms and solid relief); strength-density-thickness relations are also shown in graphs. It was concluded that reducing the variations in thickness, by more exact hot pressing, would be an important means of improving mechanical strength; extremely defective spots were probably due to faulty gluing. Most of the boards far exceeded the quality specification of DIN 68750, but all minimum values of bending strength were far below it. It is shown that from an average of 10 specimens, no representative result for either bending strength or density is obtainable. DIN 52352 requires revision, adapting the choice and number of specimens to the actual variation demonstrated.

1227. KUMAR, V. B. **Non-destructive test for the quality evaluation of fibre boards.** *Svensk PappTidn.* 61 (15), 1958 (461–70). 11 refs. [E.e.sw.g.] P.R.

Discusses the need for non-destructive tests, and the effect on properties of raw material and process used. Since board thickness is related to density, and thus to bending strength and to some extent to water absorption, swelling etc., it can serve as a guide to quality. Correlations between the various properties and variations in the thickness and in other properties from boards pressed in different daylights of the press are shown in graphs. The Brinell hardness test could not be related to either thickness or density. Moisture content is related to most physical and mechanical properties but reliable moisture meters are lacking. Relationships between modulus of rupture, elasticity and work to maximum load are tabulated.

1228. HOFSTRAND, A. D. **Relationship of specific gravity to moduli of rupture and elasticity in commercial hardboard.** *For. Prod. J.* 8 (6), 1958 (177–80). 5 refs.

Analyses test results on 36 boards differing in method of manufacture, thickness etc. Scatter was considerable, but significant correlations existed for almost every type of board, though no one equation fitted them all.

1229. OHNUMA, K. **Some experiments of measuring the thermal diffusivity of hardboard.** *J. Jap. Wood Res. Soc.* 3 (4), 1957 (121–5). 7 refs. [E.jap.] P.R.

Samples from 3 different Japanese and 2 Swedish-made hardboards were exposed to heat in an experimental apparatus producing cosine-wave temperatures. The sp. gr., m.c., and the thermal diffusivity and conductivity are tabulated for the different hardboards, and the results compared with those of other workers.

1230. HOLMGREN, B. Vorschlag zur Bestimmung der Wasseraufnahme bei Holzfaserplatten. [**Determining the water absorption of fibreboards.**] *Holz Roh- u. Werkstoff* 15 (6), 1957 (252–4). [G.g.e.] P.R.

Describes a new apparatus developed by the author, which makes testing possible at a constant temperature of 25° C., shortens the testing time and facilitates temperature regulation. Tap-water is used instead of distilled water and the pH value can in most cases be neglected. A frame holds the specimens at an angle of 45°, so that more can be accommodated in a given volume and the height of the water is of less importance. Emphasizes the disadvantages of the standards for testing water absorption drawn up at the FERODA conference in Rome.

1231. JOHNSON, E. A. N. **Dry process for manufacturing hardboard.** *Wood Wkg.* 60 (8), 1958 (37–43). P.R.

Discusses the merits of the dry as compared with the wet process and the raw materials used, and describes methods and equipment.

1232. PEEL, J. D. **The suitability of Rubberwood as a raw material for fibreboard.** *Malay. Forester* 21 (2), 1958 (112–5).

Summarizes and tabulates the results of experiments carried out at Kepong into the effect of various operating variables on the properties of fibreboard made from *Hevea brasiliensis* wood by the Defibrator process on a laboratory scale. [Cf. *F.A.* 18 No. 1125.]

1233. ANDERSON, A. B. **The influence of bark in wood as raw material for insulation and hardboard.** *Comp. Wood* 4 (4), 1957 (65–72). 28 refs. P.R.

A paper presented at the International Consultation on Insulation Board, Hardboard, and Particle Board, Geneva, 1957, reviewing recent work on unbarked wood, in particular Douglas Fir. Strength properties and processing are discussed. The use of unbarked slabs for hardboard obviates the need for sizing agents, as Douglas Fir bark has strong water-repellent properties. [Cf. *F.A.* 13 No. 3474; 19 No. 3626.]

1234. FINKEL, M. **Attempts to manufacture board from the bark left after extraction of tannins.** British Paper & Board Industry Research Association, Kenley. [1958?] pp. 8. 7 refs. Transl. by W. Manz from *Industr. Lemn.* 4 (6), 1955 (237–41). [See *F.A.* 19 No. 1147.] Limited distribution.

1235. BRAUNS, O., and STRAND, A. Värmebehandling av hårda träfiberskivor. **[Heat treatment of hardboard.]** *Svensk PappTidn.* 61 (14), 1958 (437–44). 21 refs. [Sw.sw.e.g.] P.R.

Describes experiments in a laboratory kiln with commercial-type boards of various thickness made from Spruce and Pine. Heat transfer from air to board was greatly accelerated by increasing air velocities particularly up to ca. 6 m./sec. Under heat treatment using constant velocity but different temperatures, strength (in bending and tension) first increased but later declined; hygroscopicity and dimensional stability of thickness improved, first rapidly, then slowly. For strength, treatment at 170° C. is recommended, as the strength here reaches a maximum after ca. 3 hours and declines but slowly thereafter, while at higher temperatures the strength/time curve, after a steep rise, falls sharply, which would be unfavourable in practice. Higher air velocities also produced steeper rises and falls of the strength/time curve than lower velocities. When superheated steam or N was used as a heating medium, the decline in strength was largely or wholly arrested, N being superior to steam at high temperatures (190°).

866. Utilization of Wood Extractives

1236. VIZOVIŠEK, I., and STROJIN, F. Oplemenitenje kostanjevega taninskega ekstrakta s kemičnimi sredstvi. **[The chemical refinement of Chestnut tannin extract.]** *Zborn. Inst. gozd. lesn. Gospod. Sloven.* No. 2, 1957 (199–203). [Sloven.f.]

Describes briefly the development of the tannin industry in Jugoslavia, listing the tree species used. It is claimed, on the basis of laboratory and industrial experiments, that Chestnut tannin extract can be refined by chemical processes, thus reducing or eliminating imports of Quebracho extract.

1237. DHAMACHAREE, B. **[Cutch.]** *Vanasarn* 16 (2), 1958 (31–4). 3 refs. [Siam.e.]

Analyses of cutch, extracted in the native manner by boiling chips of *Acacia catechu* for ca. 12 hours and evaporating the solution so obtained, gave the following average data: moisture 11·7–14·2%, tannin 56·4–62·5%, catechin 13·5–17·8%, extractives 20–32%, insolubles 2·9–5·6%, ash 1·2–1·5%.

867. Destructive Distillation

See also No. 95.

1238. ANDREEVA, Z. N., ARTEM'EV, B. D., and SBITNEV, B. S. Énergohimičeskaja ustanovka dlja utilizacii drevesnyh othodov. **[An installation for utilizing waste wood in the form of energy and chemicals.]** *Lesn. Prom.* 1958 (6), (10–1). [Russ. russ.]

The experimental installation, set up at an industrial log depot, consists of a gas generator to which comminuted waste wood and sawdust are conveyed. On leaving the generator, the gas (at a fairly steady temperature ca. 78° C.) is cleaned of dust, and the moisture, tars and acids extracted. The gas has a calorific value of 1200 kcal./cu.m., and is to be used (with a 10–15% admixture of diesel fuel) in a gas/diesel engine Model 1-D-12.

1239. SLAVJANSKIJ, A. K. Transportabel'nyj énergohimičeskij agregat. **[A movable installation for utilizing waste wood in the form of energy and chemicals.]** *Lesn. Prom.* 1958 (6), (12–3). [Russ.]

This installation, described in detail, uses a 2-stage method of gasification, in contrast to the direct or single-stage method employed elsewhere [cf. preceding abstract]. The chipped wood waste is first heated to 275° C., the products being concentrated acids. In the second stage it is heated to 800° and gas, tars, acids etc. are extracted, wood charcoal remaining. The gas has a calorific value of 4000 cal./cu.m.

1240. HASSLER, J. W. **Active carbon in America—1914 to 1957.** *For. Prod. J.* 8 (6), 1958 (25*A*–27*A*).

Discusses its mode of action, uses, and manufacture. Ca. ½ of the > 100 million lb. produced in 1956 was made from soda-pulp mill waste.

89. Other ('Minor') Forest Products

892. Vegetable Products

See also No. 220.

1241. THIERET, J. W. **Economic botany of the Cycads.** *Econ. Bot.* 12 (1), 1958 (3–41). 296 refs.

Contains sections on cycads as food plants, poisonous plants, gum yielders, medicinal plants, oil-yielding plants, nitrogen fixers, horticultural plants and fibre plants, the *Cycas* leaf industry, and miscellaneous uses.

892.1. Grass. Litter. Leaf Fodder etc.

See No. 519.

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 222, 530–1, 999, 1005, 1014, 1016, 1233–4, 1236–7, 1328.

1242. HILLIS, W. E., and URBACH, G. **Leucoanthocyanins as the possible precursors of tannins.** *Nature, Lond.* 182 (4636), 1958 (657–8). 11 refs.

[Cf. *F.A.* 18 No. 3692; 19 No. 5004.] Gives the results of an examination of tannins from *Acacia mollissima*, *Eucalyptus wandoo*, and *Rhizophora* spp., and kino from *E. calophylla*.

1243. JEFFERS, J. N. R., and HOWELL, R. S. **Use of a fractionally-replicated design in a pilot survey of moisture content and specific gravity of Spruce and Pine bark.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (151–9).

A statistical study of the use of a fractionally replicated factorial design in a pilot survey of m.c. and sp. gr. of Sitka and Norway Spruce, and Scots and Corsican Pine bark, in connexion with a tanbark survey. By use of this design it has been possible, on a far smaller number of samples than that necessary with a completely random sampling design, to determine over-all figures for the m.c. and sp. gr. of bark, and the dependence of these on position of the sample in, and age of, the tree. Estimates of variance are given which will enable future surveys to be planned and stratified so as to give results to any predetermined degree of accuracy. It was also found that m.c. did not vary with species within a

genus, with season of collection, dominance of tree, or quality class of the stand, so that these factors can be ignored in future sampling surveys.

1244. RICHARDS, E. G. **Extractives from wood and bark.** *Rep. For. Res. For. Comm., Lond. 1956/57*, 1957 (82).

Analyses of conifer barks have been made in collaboration with the British Leather Manufacturers' Research Asociation. Moisture-free Japanese Larch bark has on average a tannin content of ca. 17·2% and European Larch bark ca. 12·3%, both figures being higher than that normally given by Oak bark. Analyses were also made of Sitka Spruce bark obtained by various methods of peeling. Mechanically-peeled bark was found to have a lower tannin content and an undesirably deeper red colour than hand-peeled bark. This deterioration was almost certainly due to the activity of oxidizing enzymes released when the cell structure is destroyed. The fall in tannin content can be reduced by steaming the bark immediately after peeling, but attempts to control it by treating it with enzyme inhibitors have not so far succeeded. A study was made of the rate at which Sitka Spruce bark deteriorates when left lying on the forest floor. It was found that if the bark was not removed within ca. 4 weeks of peeling, the tannin content fell and the red colour increased to an undesirable intensity. Investigations have also been made into the apparent variation in the tannin content of Oak and Sitka Spruce from standing timber throughout the year. Results so far indicate that winter-harvested bark is somewhat inferior to that obtained at other times of the year.

1245. ANDERSON, H., and BILKENS, A. **Investigations on the tannins of *Pinus radiata* bark.** *Aust. J. appl. Sci.* 9 (2), 1958 (183–91). 5 refs. P.R.

The extraction of the bark of *P. radiata* has been investigated and satisfactory techniques developed for extracting 84% of tannins. A method of temperature fractionation has been elaborated that removed the darker and less soluble constituents. The improved extract has been tried for tanning sole leather and gave a leather slightly inferior in appearance, but equal in other respects, to leather tanned with Mimosa extract.

1246. CHAUDHURI, M. A. M. **A report on Mangrove and other tanstuffs of East Pakistan.** *Pakistan J. For.* 7 (4), 1957 (305–18).

It is pointed out that no organized sources of supply as yet exist, even for the region's chief tanning species, viz. *Acacia arabica*, *Ceriops roxburghiana*, *Cassia fistula* and myrobalans (*Terminalia* spp.): the merits of other promising species, all in the Sunderbans, are listed.

1247. SOKOLOV, P. D. Issledovanie tannidonosnyh svojstv kaškary (*Rhododendron aureum* Georgi). **[Investigations on the tannin yield of *R. aureum*.]** *Bot. Ž.* 43 (3), 1958 (437–43). 18 refs. [Russ.]

Analyses of the leaves of *R. aureum* growing in forests of *Pinus sibirica* in the region immediately south of Lake Baikal revealed tannin contents of 7·17–9·40%. The weight of shoots with leaves, and of leaves alone in the green state, and of air-dry leaves (m.c. 8%), were determined for 2 plots, each of 5 × 5 m.; assuming a tannin content of 8%, it is calculated that a tannin yield of ca. 100 kg./ha. could be obtained. The recovery of the bushes after defoliation was also examined. The localities where this shrub grows are remote from settlements and somewhat difficult of access. Further studies are necessary to determine whether the species would be worth cultivating for tannin.

1248. OSMOLA, N. H. Dinamika nakoplenija tannidov v list'jah skumpii *Cotinus coggygria* Scop. **[The course of the accumulation of tannins in leaves of *Rhus cotinus*.]** *Bot. Ž.* 43 (4), 1958 (581–3). [Russ.]

Investigations during 1954 and 1955 in the Western Ukraine on (*a*) the purple- and (*b*) the green-leaved forms of *Rhus cotinus* showed that, with both, the tannin content of the leaves was lowest in June, and increased during the growing season. In (*b*) it reached its maximum in Aug. (ca. 21%, oven-dry basis), and in (*a*) in October (ca. 33%). Also, a greater proportion of good-quality tanning extract was obtained from (*a*) than from (*b*).

1249. FAHEY, M. D. **Organic chemistry of bark phenolic acid.** *Abstr. of thesis*, in *Dissert. Abstr.* 18 (5), 1958 (1618–9). O.R.S.

Reports in detail the results of studies on bark phenolic acid of *Abies concolor*. [Cf. *F.A.* 19 No. 1188.]

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants etc.

See also No. 527.

1250. PIASKOWSKI, S. Wstępne badania nad otrzymywaniem i zastowaniem preparatów z czarnej huby brzozowej w przypadkach nowotworów złośliwych u ludzi. Doniesienie tymczasowe. **[Preliminary studies on the preparing and use of preparations from *Poria obliqua* for the treatment of malignant tumours. Provisional report.]** *Sylwan* 101 (10), 1957 (5–12). 16 refs. [Pol.russ.f.e.g.]

[Cf. *F.A.* 17 No. 3481.] Presents the results of analytical and clinical tests. Ten out of 48 patients treated showed some improvement.

1251. RAPOPORT, H., *et al.* **Alkaloids of *Geissospermum vellosii*.** *J. Amer. chem. Soc.* 80 (7), 1958 (1602–4). 12 refs. O.R.S.

Five new alkaloids were isolated from the bark.

1252. HUGHES, N. A., and RAPOPORT, H. **Flavopereirine, an alkaloid from [the bark of] *Geissospermum vellosii*.** *J. Amer. chem. Soc.* 80 (7), 1958 (1604–9). 18 refs. O.R.S.

1253. TOMITA, M., and NAKANO, T. **Studies on the alkaloids of rutaceous plants. I. Alkaloids [from the bark] of *Phellodendron amurense* Rupr. (1).** *Pharmaceutical Bulletin, Tokyo* 5 (1), 1957 (10–2). 9 refs. [E.e.] O.R.S.

1254. MORTIMER, P. I. **The structure of *isopelletierine* from *Duboisia myoporoides* R. Br.** *Aust. J. Chem.* 11 (1), 1958 (82–5). 17 refs. O.R.S.

1255. REVOREDO, N. L. **Hypoglycemic action of *Eucalyptus citriodora*.** *Monitor de la Farmacia y de la Terapéutica, Madrid* 64, 1958 (37–8). [Span.?] From *abstr.* in *Chem. Abstr.* 52 (12), 1958 (10414). P.R.

The leaves contain wax, resins, bitter principles, tannin, mucilaginous material, pectin, saponins, and myrtillin. Oral administration of the extract produced a temporary hypoglycemia in rabbits. Administration of the extract preceding a glucose tolerance test produced flat blood-sugar curves. The action is ascribed to the myrtillin content.

1256. PENNINGTON, C. W. **Tarahumar fish stupefaction plants.** *Econ. Bot.* 12 (1), 1958 (95–102). 23 refs.

The plant materials used by the Tarahumar, a semi-nomadic agricultural people of western Chihuahua, include leaves and bark of *Juglans rupestris*, *Carya illinoensis* and *Prunus* spp., roots of *Mimosa dysocarpa*, and bark of *Casimoroa* spp., *Sebastiania pringlei* and *Sapium biloculare*.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also Nos. 95, 115, 147, 188, 219, 533.

1257. MIROV, N. T., and ILOFF, P. M., JR. **Chemical composition of gum turpentines of Pines XXIX. A report on *Pinus ponderosa* from five localities: central Idaho, central Montana, south-eastern Wyoming, north-eastern Nebraska and central eastern Colorado.** *J. Amer. pharm. Ass.* (*sci. Ed.*) 47 (6), 1958 (404–9). 8 refs. O.R.S.

1258. MIROV, N. T. **Composition of gum turpentine of Pines. XXX. A report on *Pinus serotina*, *P. tenuifolia* and *P. yunnanensis*.** *J. Amer. pharm. Ass.* (*sci. Ed.*) 47 (6), 1958 (410–3). 9 refs. O.R.S.

P. serotina turpentine consisted of *l*-α-pinene 5%, *l*-limonene 90%, methyl chavicol 1%, and 2–3% unidentified sesquiterpenes; that of *P. tenuifolia* of *d*-α-pinene 77%, *l*-β-pinene 6–7%, Δ^3-carene 8%, terpinolene 1–2%, methyl chavicol < 1%, linalool about 1%, sesquiterpene 1%; and that of *P. yunnanensis* of *l*-α-pinene 87%, possibly small amounts of *l*-β-pinene, oxygenated terpene compounds 5–6%, and apparently no sesquiterpenes.

1259. BARDYŠEV, I. I., and ČERČES, H. A. Izodekstropimarovaja kislota—komponent smoljanyh kislot živicy kedra sibirskogo—*Pinus sibirica* (Rupr.) Mayr. **[*Isodextropimaric acid—a component of the resin acids of *P. sibirica*.*]** *Dokl. Akad. Nauk SSSR* 120 (5), 1958 (1025–30). 15 refs. [Russ.] A.P.B.

1260. JENNEN, A. Valorisation de l'essence d'*Eucalyptus dives* par transformation de pipéritone en thymol. **[Rendering the oil of *E. dives* marketable by converting the piperitone into thymol [by oxidation].]** *Bull. agric. Congo belge* 49 (2), 1958 (487–507). 49 refs. [F.du.]

1261. DALTON, L. K., and LAMBERTON, J. A. **Studies of the optically active compounds of Anacardiaceae exudates. I. The long-chain alicyclic keto alcohol of Tigaso oil [obtained as an exudate from *Campnosperma* sp.]. II. The action of alkali on the long-chain alicyclic keto alcohol of Tigaso oil. III. The long-chain alicyclic keto alcohols from the exudate of *Campnosperma auriculata* Hook. F.** *Aust. J. Chem.* 11 (1), 1958 (46–81). 32 refs. O.R.S.

1262. DAUGHERTY, P. M., SINEATH, H. H., and WASTLER, T. A. **Industrial raw materials of plant origin. IV. A survey of *Simmondsia chinensis* (Jojoba).** *Econ. Bot.* 12 (3), 1958 (296–306). 90 refs.

Covers characteristics of the liquid wax, derivatives, and economic potential, particularly as a replacement for sperm whale oil (of similar character and properties). W. H. Hodge adds supplementary notes on this excellent source for eicosenoic, and docosenoic acids and eicosenol and docosenol. [Cf. *F.A.* 20 No. 219.]

1263. MUKHERJEE, S., and SHRIVASTAVA, A. N. **The structure of *Acacia sundra* gum. Part I. Nature of sugars present and structure of the aldobiuronic acid.** *J. Amer. chem. Soc.* 80 (10), 1958 (2536–8). 21 refs. O.R.S.

1264. HIRST, E. L., PERCIVAL, E., and WILLIAMS, R. S. **The structure of *Brachychiton diversifolium* gum (*Sterculia caudata*).** *J. chem. Soc.* May, 1958 (1942–50). 22 refs. O.R.S.

1265. KNJAZEVA, L. A. Obrazovanie gutty v molodyh kornjah bereskleta evropejskogo. **[Gutta percha in young roots of *Euonymus europaeus*.]** *Dokl. Akad. Nauk SSSR* 119 (3), 1958 (602–5 + 1 plate). 7 refs. [Russ.russ.] A.P.B.

Roots from 30 seedlings of 4-year-old *E. europaeus* in the Serebryanoborsk forest were analysed for gutta-percha content. Gutta was found in roots of all ages, even the newest, which indicates that it is a constant metabolic product in this species. In roots of only primary growth, cells with gutta are found in the central cylinder near or round cells of the primary phloem. In roots having secondary growth, gutta is found inside the primary phloem. [Cf. *F.A.* 20 No. 956.]

892.7. Fruits. Seeds. Fibres, Yarns and Flosses

See also Nos. 201, 532.

1266. FAROOQ, M. O., VARSHNEY, I. P., and HASAN, H. Sur une sapogénine d'*Albizzia procera* Benth., acide machaérinique. **[A sapogenin of *A. procera*: machaerinic acid.]** *C.R. Acad. Sci., Paris* 246 (23), 1958 (3261–3). 7 refs. [F.f.] O.R.S.

The acid was derived by hydrolysis from a new saponin isolated from the seeds.

892.8. Heather. Broom, etc. Osiers. Canes and Bamboos. Reeds and Rushes. Thatching Materials

See also Nos. 1205–6.

1267. **Kiln drying basketry Willow.** *Rep. For. Prod. Res. Bd., Lond. 1957*, 1958 (9–10).

As traditional processes of air drying and storing of Willow for basket making may involve heavy losses in unfavourable weather, from moulds and stain, tests were made to find out whether Willow rods could be dried rapidly in a timber-drying kiln. Results showed that at very low humidities and ca. 70° C. they could be dried in 2-in. layers separated by 1-in. sticks, in 10–12 hours.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY.

90. General

902. History of Forests and Forestry

1268. BJARNASON, H. Lög um skógrækt 50 ára 1907–1957. **[The 50th anniversary of [Icelandic] forest legislation 1907–1957.]** Skogrækt Ríkisins, Reykjavík. 1957. pp. 88. [Ice.e.]

Outlines the history of tree planting in Iceland before the first forest law of 1907 and developments since that date, and gives notes on the success of various exotics introduced in the periods 1899–1913 and 1936–1957. The English summary also includes data on climate, soils etc.

1269. HEYWARD, F. **History of industrial forestry in the South.** University of Washington College of Forestry, Seattle. 1958. pp. 50. (*Col. William B. Greeley Lectures in Industrial Forestry* No. 2.) [Cf. *F.A.* 19 No. 3664.]

903. Forest Policy, General

1270. SPEIDEL. Hauptaufgaben der deutschen Forstpolitik in der Gegenwart. **[The main tasks of [W.] German forest policy today.]** *Allg. Forstzeitschr.* 13 (14), 1958 (193–6). 19 refs. [G.]

In order to reduce timber imports, or even to hold them at their present level, an increase in yield from the W. German forests as a whole is required. This can best be achieved in small private forests by improving forestry education and advisory services, and by consolidating scattered holdings and making regulations to prevent a recurrence of land division. In large private forests the main obstacles to better yields are taxation and lack of capital for investment, e.g. in roadbuilding. In communal forests more attention should be paid to long-term planning and sustained yield, than to measures aimed at immediate income. To improve yields from state forests, better organization is urged.

1271. JELEM, H. Waldbau und Forstpolitik. **[Silviculture and forest policy.]** *Allg. Forstztg.* 69 (9/10; 11/12), 1958 (124–7; 146–9). [G.]

Discusses measures for improving conditions and productivity of Austria's small farm forests, including site surveys, state help in supervision, management and silvicultural planning, conditions to be laid down for various subsidies (conversions (mostly from coppice to high forest), compounding of pasture rights, fencing, mechanization etc.), needs for changes in the forest laws etc.

1272. CARTER, J. **China plans to raise timber output.** *Timb. Tr. J.* 226 (4278), 1958 (74–5).

Gives some details of the 1953–57 and 1957–62 plans, with achieved and target productions of 20 and 31–34 million cu.m. timber respectively. Notes deal with area planted, species used, timber reserves and distribution, photographic reconnaissance, organization and mechanization under Soviet advice.

1273. SAMAPUDDHI, K. **A note on the facts leading to the interrelation of the various forestry projects.** *Vanasarn* 15 (4), 1957 (7–11). [E.]

Some account of the 14 inter-linked projects of the Forest Department's ten-year development programme (1952–61) against the background of increasing forest destruction, a total of only 2733 sq. km. of reserves by the end of 1955 compared with the goal of 270,000 sq. km., and a permanent staff of whom only 10% are forestry trained. Project No. 12, the development of lac cultivation, has been undertaken at the express order of the Ministry of Agriculture, the whole industry having become derelict.

1274. GALLANT, M. N. **Report to the Government of Ghana on prospects of development of the forest industry.** Expanded Technical Assistance Programme, FAO, Rome. *FAO Report* No. 863, 1958. pp. 52. Limited distribution.

1275. HUMBLET, P. Communication sur la politique sylvicole en vigueur au Congo Belge. **[Current forest policy in the Belgian Congo.]** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (88–96). [F.]

1276. ROBERTSON, B. R., and SHULL, S. C. **Forest policy and some of its implications in Maryland.** *Miscellaneous Publication, Maryland Agricultural Experiment Station, University of Maryland, College Park, Md.* No. 277, 1956. pp. 22. 21 refs.

904. General Regional Accounts of Forests and Forestry

1277. Le monde forestier. Volume 1. L'Europe et l'U.R.S.S. **[Forests of the world. Volume 1. Europe and the U.S.S.R.]** FAO, Rome. 1957. pp. 296. [F.]

Data have been compiled from FAO archives on forest statistics, forest types, management, logging

methods, forest policy, forest industries, and economic trends. The present volume gives this information separately for each European country and the U.S.S.R. Vol. 2 will cover Africa and the Near East, Vol. 3 Asia and Oceania, and Vol. 4 the Americas.

1278. McEvoy, T. **Forestry in Ireland.** *Advanc. Sci.* 14 (56), 1958 (307–16). O.R.S.

1279. **Forestry in Northern Ireland.** Ministry of Agriculture, Northern Ireland. 2nd ed. 1958. pp. 20 + map. [Cf. *F.A.* 16 No. 2536.]

1280. L'économie forestière en République Fédérale Allemande. **[Forests and forestry in the German Federal Republic.]** *Bull. Soc. for. Belg.* 65 (7), 1958 (489–524). [F.]

An account contributed by the Forestry Division of the Ministry of Agriculture at Bonn.

1281. La forêt française. **[The French forest.]** *Bull. Soc. for. Belg.* 65 (5), 1958 (313–76 + 4 photos). [F.]

A conspectus of French forests and forestry by the Administration des Eaux et Forêts.

1282. Jansen, W. L., and Stoffels, A. Les forêts et l'économie forestière néerlandaises. **[Forests and forestry in the Netherlands.]** *Bull. Soc. for. Belg.* 65 (8/9), 1958 (567–76 + 1 photo). 10 refs. [F.]

1283. Hedlund, H., and Tamm, O. **Your guide to Swedish forestry.** Swedish Forestry Association, Stockholm. 1958. pp. 32. [E.]

Consists of a brief history, an account of Swedish forest soils, data on resources, increment, fellings, land ownership, sections on silvicultural practice and the importance of forestry to Sweden, and a Who's Who in Swedish forestry, listing names and addresses under administration, research and education, societies and associations, museums, and forestry periodicals.

1284. L'industrie finlandaise du bois. **[The Finnish wood industry.]** *Rev. Bois Appl.* 13 (7/8), 1958 (39–40). 3 refs. [F.]

A brief account, giving details of the forested area, ownership, proportions of main timber species, annual increment, the amount of wood used by the various industries, and exports.

1285. **[Forest industry in the U.S.S.R.]** *Lesn. Prom.* 1957 (10), (3–32). [Russ.]

[Cf. *F.A.* 20 No. 1309.] An issue commemorating the 40th anniversary of the October Revolution, containing papers on: Forestry in the U.S.S.R. and its distribution (*N. V. Nevzorov*); The sawmilling and woodworking industry on the increase (*G. M. Benenson*); Science in the service of forest mechanization (*K. I. Voronicyn*); The scientific basis of the national sawmilling industry (*D. S. Rožkov*); The academy of forest engineers (*V. M. Nikitin*); Technical reorganization of Soviet floating (*A. I. Popov*); A new life for forest workers (*N. P. Vtorušin*); From Vologda to the North (*N. Volkov* and *A. Laptev*); Using the forest riches of Siberia (*A. V. Rešetov* and *M. S. Miller*); Forest industry of the U.S.S.R. in figures (*V. Ivanter*).

1286. Lesnaja promyšlennost' SSSR 1917–1957. 1. Lesoèkspluatacija. **[Forest industry of the U.S.S.R. 1917–1957. 1. Forest exploitation.]** Goslesbumizdat, Moskva. 1957. pp. 256. 17 refs. [Russ.] Price *Roubles* 4.95.

Covers the economic importance of the forests to the U.S.S.R., including their general characteristics and distribution. Describes felling, extraction and land transport for the periods 1917–27, 1928–32, 1933–40, World War II, and the post-war years. Particular attention is paid to the rate of growth of production, to the increase in mechanization, and to methods of further increasing both. An account is given of the importance, organization, and methods of floating, the mechanization of river work, and the outlook for development in this field. Finally, describes briefly (pp. 241–56) the resin-tapping industry in pre-revolutionary times, and before and during the Soviet 5-year plans, and its future prospects.

1287. Lesnaja promyšlennost' SSSR 1917–1957. 2. Lesopilenie i derevoobrabotka. **[Forest industry of the U.S.S.R. 1917–57. 2. Sawmilling and woodworking.]** Goslesbumizdat, Moskva. 1957. pp. 166. 2 refs. [Russ.] Price *Roubles* 2.90.

The first part of the book is devoted to an account of the scope, importance and growth of the sawmilling and woodworking industries in the pre-revolutionary period, for 1918–27 and 1928–40 (period of the 5-year plans), during World War II, and in the post-war 5-year plans. Their future prospects are also reviewed. The latter part details the timber demand and the organization of supplies, and the place of wood in the national economy.

1288. Lesnaja promyšlennost' SSSR 1917–1957. 3. Lesnaja nauka i kadry. **[Forest industry of the U.S.S.R. 1917–1957. 3. Forest science and workers.]** Goslesbumizdat, Moskva. 1957. pp. 161. 1 ref. [Russ.] Price *Roubles* 2.70.

Describes the organization of forest work; the training of workers; the organizations concerned with scientific research in felling and extraction, water transport and woodworking; and the history of Soviet scientific and technical publications and the organizations dealing with forestry and woodworking.

1289. Metaxas, N., and Makris, K. Les forêts et la sylviculture helléniques. **[Greek forests and forestry.]** *Bull. Soc. for. Belg.* 65 (8/9), 1958 (545–66 + 2 photos). 15 refs. [F.]

1290. Karschon, R. Forêts et reboisements en Israël. **[Forests and plantations in Israel.]** *Bull. Soc. for. Belg.* 65 (7), 1958 (525–34 + 2 photos). [F.]

1291. Bhargava, N. **Forests of Salalah [, Sultanate of Muscat and Oman] and their management.** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (598–603). [E.]

1292. Loetsch, F. Die forstliche Situation Thailands. **[The forestry situation in Siam.]** *Allg. Forstzeitschr.* 13 (11), 1958 (153 . . . 157). [G.g.]

[Cf. *F.A.* 19 No. 2122.] Describes briefly the geography, climate and forest types of Siam, giving

details of the main species, and of the areas, stems/ha., b.a./ha., and total and exploitable vol./ha. of the different types. There is an urgent need to curb shifting cultivation and unlicensed fellings.

1293. LOETSCH, F. **Report to the Government of Thailand on forest inventory of the northern Teak bearing provinces.** Expanded Technical Assistance Programme, FAO, Rome. *FAO Report* No. 895, 1958. pp. 58 + 12 gphs. & dgms., 1 map. Limited distribution.

Includes sections on: (1) historical review of Teak management in Thailand; (2) sampling for the inventory; (3) forest types and their stock structure; (4) % of individual forest types in relation to total area sampled; (5) volume of standing timber in sampled area; (6) conclusions and recommendations for future management of Teak. [Cf. *F.A.* 20 No. 305.]

1294. MA, C., and LJU [LIU], H.-P. Lesa i počvy Kitaja. **[Forests and soils of China.]** Izdatel'stvo Inostrannoj Literatury, Moskva. 1955. pp. 166 + 3 maps. 11 refs. [Russ.] Translated from the Chinese by B. A. Mitbrejt and Ja. M. Berger. Price *Roubles* 9.

Part 1 (*C.Ma*) discusses the importance of forests for China in assisting the development of agriculture (influences on climate and water regime, erosion control) and as a basis for light industry, giving some data on the wood-chemical and sawmilling industries, and on the production of oils, gums, tannins etc. from trees. The forested areas of China, and the 4 forest zones (tropical, subtropical, temperate and cold) are described, with information on some of the principle species. Finally the forestry of modern China, is contrasted with that of the old regime, and future prospects are reviewed. Part 2 (*H.-P.Liu*) covers the main soil types of China, and their formation, structure, distribution and utilization. Necessary tasks in soil management are outlined. There is a 6-page geographical index.

1295. **Forestry of Japan.** Forestry Agency, Ministry of Agriculture & Forestry, Tokyo. 2nd ed. (rev.) 1957. pp. 216 + 2 maps. [E.] [Cf. *F.A.* 17 No. 2316.]

1296. MORELLET, J. Rapport général du Cameroun français. **[General report on the [forests of the] French Cameroons.]** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (12–21). [F.]

1297. BÉGUÉ, L. Les forêts de Madagascar. **[The forests of Madagascar.]** *Proc. 4th World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (3–11). [F.]

1298. AUBRÉVILLE, A. Les forêts du Brésil: étude phytogéographique et forestière. **[The forests of Brazil: an ecological and silvicultural study.]** *Bois For. Trop.* Nos. 59; 60, 1958 (3–18; 3–17). [F.e.span.]

Reviews the principal forest types, their distribution and present condition, future needs, and forest policy.

1299. MABESA, C. **The Philippine forests (with special reference to dipterocarp forests).** *Proc. 4th. World For. Congr., Dehra Dun 1954*, 3, 1956 [1958] (57–87). 12 refs. [E.]

1300. FERGUSON, K. V. M. **Handbook of forestry in Victoria.** *Misc. Publ. For. Comm. Vict.* No. 7, 1957. pp. 64.

Contains chapters on: (1) history, (2) forest policy, administration and management, (3) private forestry, (4) forest regions and types, and (5) notes on the occurrence, characteristics, and timber of the Victorian Eucalypts.

905. Forest Statistics and Resources

1301. España. Estudios hispánicos de desarrollo económico. Fascículo V. La producción forestal y el crecimiento económico. **[Studies of economic development in Spain. Volume V. Production of the forests and economic expansion.]** Instituto de Cultura Hispánica, Madrid. 1957. pp. 531. [Span.]

A comprehensive work, covering mainly the years 1950–55 and presenting data on: (1) the forests, their extent and exploitation, machinery owned by the forest service, production of seed and nursery plants; (2) timber: domestic consumption of various classes, imports, exports, annual cut, estimates of future production, development of demand over the years 1900–56, areas reforested with quick-growing species, expenditure on the forests; (3) smallwood (e.g. for fuel, charcoal and tannin extraction), domestic consumption, exports, value, costs; (4) the following ancillary forest industries (giving figures for production, domestic consumption, exports, probable future demand and costs): esparto, cork, resin, edible fruits, essential oils, beekeeping, rubber; (5) silvicultural and hydrological works; (6) hunting and fishing; (7) forest grazing, with notes on 18 different regions; (8) pest control; (9) fire control; (10) research, training and propaganda; (11) machinery used in various forestry operations; (12) labour (seasonal aspects); (13) possible expansion of production from the forests; (14) expenditure; (15) net production from the forests in 1955 and possible future production.

1302. ABETZ, K., and SCHULZE-BIERBACH, F.-K. Die Gliederung des Einschlags im Kleinprivatwald Südbadens nach Holzsorten. **[The distribution by assortments of the annual cut in the small private forests of S. Baden.]** *Allg. Forst- u. Jagdztg.* 129 (7), 1958 (137–45). 2 refs. [G.g.]

Analyses the proportion of fuelwood, pulpwood, poles, sawtimber etc. for the years 1951–53, and concludes that only for hardwoods (i.e. not for softwoods or all woods combined) was the proportion of fuelwood considerably greater than in state-owned or large private forests.

1303. Ergebnisse der österreichischen Waldstandsaufnahme 1952/56. Band 6. Steiermark. **[Results of the Austrian forest survey 1952–56. Vol. 6. Styria.]** Forstliche Bundes-Versuchsanstalt Mariabrunn in Schönbrunn, Wien. 1958. pp. 108 + 147 + 41. [G.] [Cf. *F.A.* 19 No. 5038.]

1304. Ergebnisse der Österreichischen Waldstandsaufnahme 1952/56. Band 2. Kärnten. **[Results of the Austrian forest survey 1952–56. Vol. 2. Carinthia.]** Forstliche Bundes-Versuchsanstalt Mariabrunn in Schönbrunn, Wien. 1958. pp. 99 + 145 + 43. [G.]

1305. VIGERUST, A. Sammenlikning mellom takseringen i 1919–30, takseringen i 1937–56 og den normale kubikk- og tilvekstmasse. **[Comparison between the [national] surveys in 1919–30 and 1937–56 and the normal volume and increment values.]** *Norsk Skogbr.* 4 (10), 1958 (288–92). [Nor.]

The figures for both standing volume and volume m.a.i. in the survey of 1937–56 are considerably below those calculated as normal by Langsæter in 1944. The distribution of area by felling classes also differs considerably from the normal [cf. *F.A.* 19 No. 3683]. Results of the comparisons are given in tables and graphs.

1306. Regnskabsoversigter for dansk privatskovbruk 1956/57. **[Financial review for Danish private forestry 1956–57.]** *Beretning, Økonomisk-Statistisk Afdeling, Dansk Skovforening, København* No. 12, 1958. pp. 25. [Dan.]

1307. ILVESSALO, Y. Suomen metsät vuosista 1921–24 vuosiin 1951–53. Kolmeen valtakunnan metsien inventointiin perustuva tutkimus. **[The forests of Finland and their development from 1921–24 to 1951–53. An investigation based on three National Forest Inventories.]** *Commun. Inst. for. Fenn.* 47 (1), 1956 (1958). pp. 227. [Fi.e.*e.*]

The data discussed are presented in 85 tables and 17 graphs with legends in English as well as Finnish; there is a 23-page English summary. [Cf. *F.A.* 19 No. 5031.]

1308. ILVESSALO, Y. Suomen metsät metsänhoitolautakuntien toiminta-alueittain. Valtakunnan metsien inventoinnin tuloksia. **[The forests of Finland by Forestry Board Districts. Results of the National Forest Inventory.]** *Commun. Inst. for. Fenn.* 47 (3), 1957 (1958). pp. 128. [Fi.e.*e.*]

The data discussed are presented in 46 tables with legends in English as well as Finnish; there is a 6-page English summary.

1309. STEJNBOK, B. I. [Compiler]. Lesnaja promyšlennost' SSSR. Statističeskij sbornik. **[Forest industries of the U.S.S.R. A statistical compendium.]** Goslesbumizdat, Moscow & Leningrad. 1957. pp. 295. [Russ.] Price *Roubles* 13.95.

[Cf. *F.A.* 20 No. 1285.] Presents, in 118 tables and 20 graphs, full details of the forest industry of the U.S.S.R., including: forest area by regions, hardwoods and softwoods, age classes etc.; annual cut by areas, republics, regions etc.; by assortments, by Combines and 'Trusts', and by methods of extraction and transport; timber floating; use of mechanical transport and horses; production of sawn timber, plywood, matches and furniture, for the U.S.S.R. as a whole, and by regions, republics, etc.; labour, including numbers of workers employed, wages, output per man-day and efficiency; production costs; amount of timber converted by regions, and by volume or number of the various products, capital construction, including house-building; mills, factories and other enterprises under the Ministry of Forest Industry; and a review of the achievements of the Ministry in 1956. Some data are also tabulated on world forest resources and timber production.

1310. **Forest inventory summaries—British Columbia. Nos. 1–5, 23–35, 43–92.** Forest Surveys & Inventory Division, British Columbia Forest Service. 1958. Each pp. 1 + 1 map. [Cf. *F.A.* 19 No. 5042.]

1311. BOSMAN, D. L. **Timber resources and timber utilisation in South Africa.** The South African Council for Scientific and Industrial Research, Pretoria. 1956. pp. ix + 78.

A survey has been made of the areas, volume increment, and volume of standing timber of the plantations of exotic softwoods and hardwoods established by the Department of Forestry, by municipalities and by private growers. The results, together with figures for utilization of different categories of wood products, are given in 23 graphs and 35 tables, covering the period 1945–55.

1312. MCCORMACK, J. F. **A progress report—Virginia's 2nd forest survey.** *Virginia Forests, Richmond* 12 (1), 1957 (4–7, 15, 22).

Outlines the procedure and compares the results with that of the first survey in 1940.

91. Land Use, Land-Use Policy (including Afforestation Policy)

See also No. 78.

1313. MAHNOVECKIJ, S. O promyšlennom osvoenii lesov v zonah zatoplenija. **[Industrial use of forests in areas to be inundated.]** *Lesn. Prom.* 1957 (11), (25–8). [Russ.]

Discusses some of the problems of organizing forest exploitation, timber transport, and the setting up of forest industries, to utilize the trees being felled in areas in the U.S.S.R. to be inundated by the building of hydro-electric dams.

1314. Situation et tendances de l'utilisation générale des terres—place de la forêt: France. **[The general land-use situation and trends—role of the forest: France.]** [*Docum.*] *6th Sess. FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/65-C*, 1958. pp. 36 + 6 + 1 tbl. [F.] Limited distribution.

Includes Algeria.

1315. FIGUEROA, P. Situación y tendencias de la utilización general de tierras en la cuenca mediterránea—papel que desempaña el bosque: España. **[The general land use situation and its trends in the Mediterranean basin—the role of the forest: Spain.]** [*Docum.*] *6th Sess. FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/65-A*, 1958. pp. 8. [Span.] Limited distribution.

1316. GOOR, A. Y. **The general land use situation and its trends—role of the forest: Israel.** [*Docum.*] *6th Sess. FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/65-D*, 1958. pp. 6. [E.] Limited distribution.

1317. **The general land use situation and its trends—role of the forest: Sudan.** [*Docum.*] *6th Sess. FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/65-B*, 1958. pp. 9. [E.] Limited distribution.

1318. UTLEG, J. L. **Land classification in the Philippines.** *Filipino For.* 9/10, 1958 (61–8, 95–7 + 2 dgms.). 15 refs.

Summarizes the history of land classification in the Philippines and describes the procedures involved, with special reference to the criteria used in determining land to be used for forestry.

92. Forest Ownership and Ownership Policy

See also Nos. 1269–71, 1306.

1319. RAU, R. Untersuchungen über die Waldbesitzverhältnisse im Rheinland mit besonderer Berücksichtigung des kleinen Privatwaldes. **[Forest ownership conditions in the Rhineland with special reference to small private holdings.]** *Abstr. of thesis*, in *Forsch. u. Berat. (Forstw.) Landesaussch. landw. Forsch. Landes Nordrhein-Westfalen* No. 3, 1958 (81–95). [G.]

Discusses the origin and present position of the fragmented pattern, with mean parcel sizes varying from 0·15 to 0·60 ha. and mean area per small owner between 0·5 and 2·5 ha., many of these owners being urban workers without interest in their inherited piece of land (yet not selling because of transfer costs), and possible remedies.

93. Public Supervision and Regulation of Forestry, including Legislation for these Purposes

See also Nos. 1268, 1325.

1320. FRASSOLDATI, C. La nuova *Ley de Montes* spagnola (1957). **[The new Spanish forest law (1957).]** *Ital. for. mont.* 13 (3), 1958 (101–6). 11 refs. [It.it.f.]

The author sets out the main lines of the new Spanish forest law, promulgated 10 June 1957, and discusses in particular the reservation of protective forests, which are to be managed as forest in perpetuity. These now include privately owned as well as state, municipal etc. forests, and are to be inscribed in an official schedule. Almost all existing woodland, with a few exceptions, comes into this category. The law also deals with reforestation, hydrology, forest protection, national parks, and forest industries.

1321. **[British Honduras: Ordinances Nos. 22 and 33 to amend the Forest Ordinance 1926.]** *Food Agric. Leg.* 6 (4), 1958, XIII. 1/57. 1. pp. 7.

1322. ERGINO, V. O. **An appraisal of two [Philippine] forest laws.** *Filipino For.* 9/10, 1958 (55–9, 86–9).

Discusses two laws, one regulating the use of pasture land, the other designed to prevent illegal clearing of forest for agriculture.

1323. SCHNIZLEIN, R. Das bayerische Gesetz über die Forstrechte. **[The Bavarian law on forest rights.]** *Allg. Forstzeitschr.* 13 (29), 1958 (409–15). 5 refs. [G.g.]

Summarizes the new law of 19.12.57 representing a long fought-over compromise between agricultural and forestry interests on matters of compensation, conversion, restriction and delimitation of rights to fuel and building wood, litter raking, forest pasture etc.

94. Other Methods to Implement Forest Policy

1324. ASAKAWA, R. **[The [Japanese Government] system of assistance in reforestation.]** *Forestry Technique, Tokyo* No. 181, 1957 (8–14). [Jap.]

The author describes the system, which aids both the private proprietor (generally a farmer) and communal owners, under the heads (1) subsidies, (2) loans, (3) taxation relief. Under (1) the main considerations governing monetary grants are whether the work is of public benefit, or is intrinsically difficult to execute, or will yield little economic return. A project rehabilitating headwater forests may be 100% subsidized (national sources $\frac{3}{4}$, local $\frac{1}{4}$), one for improving waste land up to 60% (national sources 50%) and other more ordinary projects up to 40% (national sources 30%), and in actual practice the % of cost thus met has ranged from 18 to 60%. The larger communal bodies, e.g. large villages, are, however, more generally aided by loans from the Loans Fund for Agriculture and Fisheries, on terms that include: interest at 6·5% p.a. for subsidized projects, 4·5% for non-subsidized; up to 5 years before first repayment and up to 20 years for full repayment; loans up to 80% of total cost of project. The merits of each type of assistance are discussed in the light of European practice. It is suggested, *inter alia*, that subsidies in kind (e.g. planting stock) are to be encouraged, that the ordinary subsidy rate might be raised to 50%; that the loan interest rates are excessive, particularly the 4·5% for unsubsidized projects; that a 20-year period for repayment is much too short; and that central government loans should also be made available to local government bodies undertaking such projects.

944. Co-operation. Collaboration of Forest Owners

See No. 552.

945.1. Advisory and Information Services, Documentation Centres

1325. LE SUEUR, A. D. C. **The forester expert witness.** *Quart. J. For.* 52 (3), 1958 (187–91).

An account of what is expected of a forester called in as expert witness in a law suit.

945.2. Publicity, Propaganda (including Demonstration Forests)

1326. **New Hall of North American Forests opened at the Museum of Natural History [New York].** *J. For.* 56 (7), 1958 (467–72).

A description of the hall, which contains life-size three-dimensional reproductions of actual forest sites from Canada and 11 American states, vegetation maps, murals, and exhibits of fauna, forest soils, forest diseases, timber harvesting, wood utilization etc.

945.3. Education. Training. (Including Educational Tours and Information on Careers)

See also No. 1.

1327. BUCHHOLZ, E. 26,000 studieren in der Sowjetunion an Hochschulen für Forst- und Holzwirtschaft. **[26,000 students of forestry and wood technology at universities in the U.S.S.R.]** *Holz-Zbl.* 84 (73/74), 1958 (940–1). 2 refs. [G.]

Describes the history and present set-up of higher

forestry training in Russia, main specialist schools or forestry faculties, types of degree courses offered, specimen curricula for forestry proper and for wood technology etc. All courses take nearly 5 years (of ca. 10 months' teaching terms). English or German is compulsory. Ca. 30% of the students are women.

945.4. Research

See also Nos. 554, 924–5, 1111, 1288.

1328. Politiques subéricoles dans les pays producteurs: Portugal. **[Cork-growing policy in the producing countries: Portugal.]** [*Docum.*] *4th Sess. Wkg. Party on Cork Oak FAO Jt. Subcomm. Medit. For. Probl., Madrid 1958*, No. *FAO/SCM/LG/2-C*, 1958. pp. 5. [F.] Limited distribution.

Mainly an account of the research programme of the Comissão para o Fomento da Subericultura.

1329. RANDHAWA, M. S. **Agricultural research in India. Institutes and Organizations.** Indian Council of Agricultural Research, New Delhi. 1958. pp. [11] + 448 + 80 plates. Price £2 2*s.* 6*d.* O.R.E.

Covers the Council for Agricultural Research, Central Research Institutes, Central Commodity Committees and their research stations, and research stations and farms of the States. The Forest Research Institute and Colleges, Dehra Dun, their history, organization and chief lines of research are dealt with on pp. 137–47, their staff on pp. 436–7.

1330. **Research programme [of the Forest Research Institute, Kepong]: Progress report 1957.** *Res. Pamphl. For. Res. Inst., Kepong.* No. 15 *D*, 1958. pp. 53.

1331. MÉTRO, A. Rapport au Gouvernement de la Tunisie sur la création d'une station de recherches forestières. **[Report to the Government of Tunisia on setting up a forestry research station.]** Expanded Technical Assistance Programme, FAO, Rome. *FAO Report* No. 803, 1958. pp. 151 + 3 dgms., 25 gphs., 1 map. [F.] Limited distribution.

1332. STEPHENSON, J. N. **Some observations on forest research in the Southern United States.** *Pulp Paper Mag. Can.* 59 (3; 6; 7), 1958 (165 . . . 172; 210 . . . 217, 224; 170–5).

Tour notes on the research programmes of the Southern and Southeastern Forest Experiment Stations, with a map showing the locations of U.S. forest service establishments and of 81 companies drawing pulpwood from the southern forests.

1333. ROY, D. F. **Forest management research in the Redwood-Douglas Fir region of California—a summary of foresters' views on research needs.** *Misc. Pap. Calif. For. Range Exp. Sta.* No. 24, 1958. pp. 17.

On the basis of interviews with men occupied with forest management in this area, principal needs in forestry research are listed. Past and current research programmes of the Californian Forest and Range Experiment Station are outlined. In view of the complex ownership pattern of the commercial forest land (ca. ⅓ is publicly owned, the rest is in small or large private holdings), the author considers that a single body should be charged with organizing a research programme that would serve the interests of all owners.

946.1. Associations. Societies

1334. AMOS, F. R. **The Society of Filipino Foresters.** *Filipino For.* 9/10, 1958 (17–22).

95. Forest Taxation

1335. MOORE, A. M. **Forestry tenures and taxes in Canada: the economic effects of taxation and of the regulating of the Crown forests by the provinces.** *Tax Paper, Canadian Tax Foundation, Toronto* No. 11, [1957]. pp. v + 315. Many refs. Price Canadian $3.00.

A comprehensive study of the charges of all kinds paid to the three levels of government (federal, provincial and municipal) by the forest industry, and their effects on the industry.

96. Forest Labour Questions. Labour Questions in Wood Transport and the Wood Industries

1336. JAMIESON, S. **West Coast strikes.** *Pulp Paper Mag. Can.* 59 (7), 1958 (105–8, 217 . . . 221). 1 ref.

A study of industrial relations in British Columbia, with special emphasis on the background to labour problems within the pulp and paper industry.

97. International Forest Policy and Other International Collaboration

971. Congresses, Conferences

See also No. 998.

1337. **Proceedings of the 4th World Forestry Congress, Dehra Dun 1954: Vol. I, Final Report.** Manager of Publications, Government of India, Delhi. 1957 [1958]. pp. 249 + 19 photos. [E.F.] Price *Rs.*14 (22*s.*).

Includes summary, reports, and recommendations.

1338. **Proceedings of the 4th World Forestry Congress, Dehra Dun, 1954: Vol. 3, General and Special Papers on Tropical Forestry.** Manager of Publications, Government of India, Delhi. 1956 [1958]. pp. vi + 709. Price *Rs.*15 (23*s.* 6*d.*).

Contains 70 papers, most of which are referenced separately in this issue of *F.A.* unless cited from earlier publication in forestry journals etc.

1339. **Proceedings, International Union of Forest Research Organisations, 12th Congress, Oxford 1956.** Forestry Commission, London. 1958. pp. 129. [E.F.G.]

1340. **Report of the 9th session of the [FAO] Conference, 2–23 November 1957.** FAO, Rome. 1958. pp. 337. [E.F.Span.]

1341. **Report of the 4th Session of the Asia-Pacific Forestry Commission, Bandung, Indonesia, 8–21 June 1957.** FAO, Rome. 1958. pp. 74.

Includes resolutions, reports of sub-committees, and a list of documents.

1342. **Report of the 2nd session of the Teak Subcommission, Bandung, Indonesia, 4–10 June 1957.** FAO, Rome. 1958. pp. 36.

Includes a list of documents.

FORESTRY THE WORLD OVER

References: 1. *Allgemeine Forstzeitschrift*, Munich; 2. *Boletin Argentino Forestal*, Buenos Aires; 3. *B.C. Lumberman*, Vancouver; 4. *Bulletin of the American Society for Testing Materials*, Easton, Pa.; 5. *Daily Telegraph*, London; 6. *Holz-Kurier*, Vienna; 7. *India News*, London; 8. *Indian Forester*, Dehra Dun; 9. *Journal of Forestry*, Washington; 10. *Press Release*, Washington; 11. *Priroda*, Moscow; 12. *Pulp and Paper Magazine of Canada*, Gardenvale, Que.; 13. *Report on the Forest Administration Northern Region of Nigeria 1957/58*, Kaduna; 14. *Revue Internationale du Bois*, Paris; 15. *Southern Lumberman*, Nashville, Tenn.; 16. *Timber and Plywood*, London; 17. *Timber Technology*, London; 18. *Timber Trades Journal*, London; 19. *Wood Industry*, Tokyo; 20. *Woodworking Industry*, London.

International Conferences

1959		
Oct.–Nov.	Central American Conifer Tour.	Mexico
1960		
Late summer.	5th World Forestry Congress.	Seattle
Oct.–Nov.	Far East Pulp and Paper Conference.	Tokyo
1961		
Aug.–Sept.	10th Pacific Science Congress.	Hawaii

A symposium on 'The Biology of Weeds' is being arranged by the British Ecological Society, to be held in Oxford during 2–4 April. The programme will include papers on the ecology, systematics and physiology of weeds, the origin and development of weed floras, competition and population studies in weeds, and dormancy characteristics of weed species.

Antarctica. Wanigans (i.e. sleeping and dining cars mounted on runners for towing behind tractors) have been constructed of plywood for use in the Antarctic by the U.S. Navy. They are mobile living quarters (20 × 8 ft.) in 'Operation Deepfreeze', part of the U.S. effort in the International Geophysical Year, and have been designed to accommodate nine men comfortably in regions where temperatures of — 80° F. with 100-m.p.h. gales are commonplace (**16**; 4.9.58).

Argentina. The centenary of the introduction of Eucalypts into Argentina is being celebrated by the planting of one million Eucalypts by the children of the national schools, beginning with a plot in San Fernando on which grows a *Eucalyptus globulus* believed to be a survivor of the original sowings. Seed was first imported from Australia in 1858 by Domingo Faustino Sarmiento (**2**; Sept. 1958).

Austria. In a comparative study of one-man work in the forest, employing 2 Swedes, 2 Germans and 2 Austrians, the Swedes, who were accustomed to one-man work, were much the fastest and appeared to use their brains far more than their German or Austrian colleagues. Time taken per tree in a stand on level ground, with a mean diam. of 19 cm., by the better of the Swedes was less than half that taken by the worse of the Germans (**6**; 23.10.58).

Canada. Northern Ontario Natural Gas Company's $15 million pipe-laying programme for this summer has passed the halfway mark. By mid-September gas will have been brought to the homes and factories (including 11 pulp and paper mills) in the 32 N. Ontario communities. The contract of at least one mill allows of the continued use of pulverized lignite to relieve the winter peak demand (**12**; Sept. 1958).

The disastrous 1958 fire season in British Columbia has resulted in a number of new ideas and practical tests of new equipment to facilitate the control of forest fires. An S-58 Sikorsky helicopter has proved invaluable for transporting men (up to 12), food and equipment (up to 1·5 tons) in the Vancouver district. The chartering of this, the largest helicopter in Canada, at $400/flying hour is considered a bargain (even at twice the price) when measured against the value of timber saved (**3**; Sept. 1958).

Cuba. A $3,600,000 building-board plant is soon to be opened in Cuba and will use de-pithed bagasse by a process developed by the Tayler Corp., N.Y. According to the firm, the bagasse hardboard produced by the new process is 15–45% stronger than board made from wood pulp. The plant will also be able to produce insulating boards, medium-density boards and processed hardboard for decorative uses (e.g. counter tops). The Cuban products are expected to be competitive with U.S. wood hardboard, but the immediate interest is in the Caribbean area (**4**; Oct. 1958).

Europe. World production of particle (chip) board is estimated to have increased by ca. 22%, from 565,000 tons in 1956 to 690,000 tons in 1957. Europe produced ca. 70% of the world total, with the Federal Republic of Germany the centre of the industry (**10**; 1.12.58).

Germany. A study group on the simplification of administration at Köln, comparing cleaning times in schools, office buildings, etc., has found that waxed wooden floors were only slightly inferior to other materials lino, stone and asphalt etc. – in this respect, and that wood treated with a sealer, either an impregnating oil-resin sealer or various types of film, was equal or slightly superior to all other flooring, including other sealed flooring (**6**; 30.10.58).

Great Britain. The first mill in this country built to produce wood pulp ('Gatecel') for papermaking from home-grown hardwood thinnings, was opened in October at Sudbrook near Chepstow. The neutral sodium sulphite process is used, and barking and pulping are continuous. This is believed to be the only mill in the world employing this process on a continuous system using a variety of hardwoods. Sound wood of at least 13 species can be used, provided that it is cut into 4-ft. lengths, 3½–12 in. in diam., reasonably straight, and not forked. The species grown in this country which are most suitable for bleached hardwood pulp are Oak, Ash, Birch, Beech, Alder, Elm, Sweet Chestnut, Sycamore Maple, Lime, Poplar, Willow, Hazel and Maple. Crown lands under the administration of the Forestry Commission will provide about one-fifth of the annual consumption of the mill (50,000 to 70,000 tons of hardwood). A large part of the Commission's supply is being cut from the Forest of Dean, which is conveniently near the mill (**18**; 4.10.58).

The Roman Catholic Church of St. Catherine, Gracemount, Edinburgh, which is one of several now being built in Scotland, is a most attractive building constructed at a low cost. Glued laminated timber arches (30 ft. span, 9 ft. to eaves, 23 ft. to apex) are the principal feature. They are of Columbian Pine, and unpainted, so that the natural colour of the wood and the lines of the laminates add to their graceful appearance. The pews are of Parana Pine, and the exterior cladding of the building is vertically laid Red Meranti, which has a pleasing natural colour (**18**; 18.10.58).

New uses for plywood are announced by Venesta Ltd., Manchester. A barrel of 4-mm. plywood, having an inner plywood sleeve insulated from the exterior wall by bands of rubber, has been approved by British Railways and the Ministry of Transport and Civil Aviation for packing carboys of acid and dangerous chemicals. Another use is for light boxes for the delivery of wreaths to destinations throughout Europe (**16**; 30.10.58).

Malayan Kapur is now being used for street lighting columns. The lamp-posts are made of four boards bonded by a phenol-resorcinol glue, wiring and control gear being housed in a hollow at the centre. The wood is durable enough to be set direct into concrete; its density is 49 lb./cu. ft., and ultimate bending stress 18,700 lb./ sq. in. The columns are made by Siemens Edison Swan Ltd., and orders have already been placed at Barry (Glam.), Ilkley (Yorks.) and Amman (**17**; Dec. 1958).

L. Lacoste & Sons of Totton, near Southampton, are producing plastic-bonded flower pots with specially graded sawdust as the principal ingredient. The new flowerpots, which look rather like cork, are practically unbreakable, light in weight, waterproof, easy to stack, and cheap to produce; they do not support fungi and they do not absorb nitrogen. Research continues for uses for the sawdust that is rejected in grading (**20**; Dec. 1958).

India. The Madras Minister of Agriculture on 23 Nov. inaugurated the first large-scale irrigated Teak-growing area, covering 4800 acres at Edanthurai about 10 miles from Mettupalayam. It is proposed to develop the area by using the waters of a small stream called Hallurhalla during the next 20 years. The present plantation is expected to return an annual yield of ca. Rs.700,000 to the State (**7**; 29.11.58).

Japan. Floors surfaced entirely with hardboard of indigenous manufacture are being installed in increasing numbers of offices, factories, schools etc., in various parts of Japan. The hardboard (Mitsui-dei), 12 mm. thick, is cut and laid in strips 1 ft. broad and then both nailed and glued (Ibon 220) to the supporting joists. The rate of wear has been found to be 4·5% versus Teak's 4·8% (**19**; Aug. 1958).

Malaya. A prefabricated schoolroom constructed of pressure-impregnated wood proved so satisfactory during 2 years' service, that 135 similar ones are now in use. They are light in weight, cool, comfortable, and cost only two-thirds as much as a brick building of the same size. Another advantage is that they can be put up or taken down very rapidly. They have a floor space of 6·7 × 9·15 m., an asphalt roof, ceiling of insulation board and a large area of window, and are intended to last for 25 years. The Forest Service's campaign to popularize a cheap prefabricated wooden house has come up against the prejudices of the Chinese in the new villages, for whom it was designed. One objection is that the doors are not symmetrically flanked by a window on each side in the traditional style, so that good luck will fly from the house. They cannot, also, be persuaded that the treated wood will resist termites and decay. Building societies are refusing to make loans on such houses for the same reasons and for alleged increased fire risk (**14**; Nov. 1958).

Nigeria. Frost damage has not hitherto been reported from Nigeria but, in the Kano fuel plantation, young coppice shoots of *Dalbergia sissoo* and *Cassia siamea* were 'blasted' by frost on the night of 10 Jan. 1957. Recorded ground temperature at Kano Airport for that night was 31° F., and it is possible that even lower temperatures may have occurred in the damaged areas, which were situated in what, in Europe, would have been regarded as typical frost hollows (**13**; 1958).

Philippines. In the church of Las Pinas (built 1762) is an organ constructed of bamboo, begun in 1818 and finished in 1822. The 950 bamboos used were covered for 6 months with beach sand to preserve them from attack by borers. The organ was badly damaged in 1862 by an earthquake, and in 1882 by rain after a typhoon. It was repaired in 1917, and an electric blower was installed in 1932 (**8**; Oct. 1958).

Sweden. Svenska Cellulosa Ab. have taken delivery of one new icebreaker and launched another on Lake Vänern. Great importance is attached to keeping the North Swedish ports navigable for the longest possible period. It cost Svenska Cellulosa Ab. about two million Kronor in extra transport costs when their ports were temporarily blocked by ice in the unusually early closing of 1957. The Swedish State's powerful icebreakers will continue to keep open a lane to the sea, and the company's new icebreakers will be kept busy maintaining access to and from the landing places to these lanes. The first of these, the 'Holmsund', which might be described as an icebreaking tug, has an over-all length of 98 feet, and is powered by a Nohab MN-14 engines of 800 effective h.p. It is equipped for sea work, with radar, echo-sounding apparatus, radio direction finder, radio telephone etc. (**18**; 27.9.58).

By comparing the pattern of annual rings on some pencil parings found on the site of a burglary with those of a pencil found in the pocket of a suspect, the Swedish police were able to bring the crime home to him (**1**; 10.12.58).

U.S.A. The North Idaho Forest Genetics Centre, a new co-operative undertaking of the U.S. Forest Service and the University of Idaho, was installed at Moscow, Idaho, in Sept. 1958. Its principal object will be the breeding of blister-rust-resistant White Pine (*Pinus monticola*). A second major project will be a study of the inheritance of growth rate and other desirable characters in resistant material, and general work on the genetics of this species and other conifers will be carried out (**10**; 22.9.58).

The U.S.D.A. is to establish a new laboratory north of Columbus, Ohio, to conduct research on midwestern forest biology problems, mainly forest insects and diseases. Scheduled for completion in 1960, this is the first of four such laboratories planned for various parts of the country. Research will be conducted jointly by the U.S. Forest Service and the Agricultural Research Service (**9**; Sept. 1958).

Rayonier's Eastern Research Division claim to have successfully injected 2-year-old living Pines with radio-active carbon (C^{14}). A cross-section of a stem cut one year after injection, showed that

most of the labelled C had been laid down in the 3rd growth ring, and some in the bark, but that there were traces of radioactivity in the two earlier growth rings, suggesting either diffusion or continued limited growth in older parts of a living tree (**15**; 15.9.58).

U.S.S.R. *Pravda* has denounced the scientists who edit *Botaničeskij Žurnal* for allowing the journal (an organ of the Soviet Academy of Science) to be used for attacks on Professor Lysenko. According to *Pravda*, Lysenko had been for years the main target of attacks in the journal and such attacks could only 'undermine the materialist basis of Soviet biology' and hinder a solution of the country's economic problems. Lysenko fell into disfavour for a few years after Stalin died in 1953, but was restored by Mr. Krushchev in 1957 (**5**; 15.12.58).

Three wooden pegs, 20 cm. long, inserted into a Scots Pine tree in the Mari ASSR at a height of 6–7 m., were found to be incorporated in the wood. The pegs were stuck in 260–270 years ago, i.e. approximately in the time of Peter the Great, and they are believed to have been used for hanging up primitive beehives (**11**; Aug. 1958).

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